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ABSTRACT

The first concept proposed by this paper for explaining the global dynamics of linguistic phenomena is "language power," the total investment in time, money, and energy that is made for the purpose of learning or preserving a particular language. Indicators that become factors in the formula for determining language power include demographics, dispersion, mobility, economics, ideology, and culture. The second concept is "language attraction." The attractiveness of a given target language is mathematically a function of its status, territorial considerations, and interlingual similarities and differences. Finally, "language pressure" may be thought of as a variety of language attraction that occurs when language territories coincide and language groups interpenetrate. The measurement of such pressure by comparing the linguistic force of the two co-existing languages provides a means for quantifying processes of cultural change. The validation of the three concepts is discussed, with examples from various European countries. Tabular data regarding linguistic forces are appended. (JB)

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THREE CONCEPTS FOR GEOLINGUISTICS

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FOREWORD

The study presented here began as a hesitating reply to an invitation to contribute to a small symposium on multinational societies (Les états multilingues: problèmes et solutions) organized through the CIRB by the International Political Science Association. The paper was first presented in Quebec in March 1972 under the title "Puissance, attraction et pression des langues en contact: modèles et indices." The detailed comments of those who heard the paper prompted me to continue working along these lines.

I am particularly grateful to Jean Laponce, Stanley Lieberson, and Dankwart Rustow for their encouragement at that time. This enabled me to present an improved version in a guest lecture at the University of Texas in Austin (Language Status and Language Contact) in April 1972. A more complete version with updated statistics was prepared for the World Congress of the International Political Science Association in Montreal (Linguistic Forces and the Feasibility of Language Policies) in August 1973. The present version was prepared for the annual meeting of the Canadian Linguistic Association in Kingston in May 1973. It was read by Richard Vigneault whom I should now like to thank publicly for all the time and care which he gave to the presentation of my paper.

I also owe a debt of thanks to the two research assistants, Dominique Dos Ghali and Serge Goriatchkine, who helped me compile the demographic statistics, and to Heinz Kloss and Grant McConnell for allowing us to use unpublished data of the Language Demography Archives of the ICRB.

Finally I should like to thank the secretaries of the Centre for their patience and attention in preparing the manuscript.

William F. Mackey

Québec 1973

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THREE CONCEPTS FOR GEOLINGUISTICS

INTRODUCTION

The purpose of this study is to present a few key concepts for a whole area of investigation which I should like to call geolinguistics. This discipline would deal with the external fate of languages as they are distributed over the face of the globe -- with the linguistic implications of such facts as the use of only 5% of the world's languages by more than half the world's inhabitants -- or 12% by almost three quarters of its population -- or the jurisdiction by only three countries of over half the population of the planet covering about a quarter of its land mass. These countries, China, the Soviet Union and India have each a main national language; yet within their borders, hundreds of other tongues are spoken, only a few of which have official regional status, a fact which creates social tension in situations of language contact. To study such problems, I should like to introduce three geolinguistic concepts -- the concept of language power, that of language attraction and that of language pressure.

By way of an introduction, I try to show that geolinguistic concepts are not purely academic and that the understanding of geolinguistic forces can save countries a lot of money, a lot of time and -- in some areas -- a lot of lives.

Although language is a universal element in human affairs, governments have generally simply taken it for granted, despite the fact that most countries need some sort of language legislation -- if only to decide what foreign languages may be taught in the schools. But it is chiefly in bilingual and multilingual countries that language regulations become questions of vital importance -- and sometimes matters of national survival. This is especially true in regulations governing education -- notably the language or languages of instruction in schools in areas of language contact.

Legislators have rarely gauged or even understood the extent to which it was possible to change the language behavior of their nationals by means of laws and regulations -- a lack of comprehension which has often led to catastrophe.

To cite only one example, take the case of India. A quarter of a century of legislative effort has failed to replace English by Hindi as a national language in India. In 1948, it was decided *not*

to organize the newly independent British colony along linguistic lines and to use the majority language, Hindi, as a uniting national tongue. According to the Constitution of 1950 English was to disappear by 1965 as a national language -- that is, as the language of parliament and the civil service. The linguistic forces within the country, however, decided otherwise.

In the southern part of the sub-continent, which is mostly Dravidian, the fight was not to do away with English -- but to maintain it while up-grading, not Hindi, but one of the regional languages. Consequently, in 1967, the central government countered with a regulation whereby the regional language was to replace English, by 1972, as the medium of instruction in schools and colleges. This move was interpreted by many non-Hindi speakers as a subterfuge to create a cultural vacuum which would eventually be filled by Hindi, the strongest remaining language and that of the majority. This resulted in linguistic revolts, resignations from the cabinet and the opposition of most Indian universities.

Meanwhile a number of Indian peoples revolted and claimed the right to create separate states in which their language would become official. After a long series of bloody encounters, the central government had gradually to yield to crisis after crisis -- first in Andhra, then in Bombay, Madras, the Punjab -- and the struggle for linguistic self-determination continues. In sum, the legislators had completely to reverse themselves, both in their opposition to the official maintenance of English and to the creation of linguistic states. The moral is that one cannot legislate lightly questions of language behavior which involve the degradation of regional languages; and a people having to choose a strange idiom as a working medium may well prefer a high-status international language to a rival regional tongue -- no matter how widespread. The Cameroons for example have chosen two foreign languages -- English and French as the only official languages of a country where dozens of native languages flourish.

This is often noticed in the history of bilingual education, especially in studying the causes of success and failure in bilingual schooling. The success or failure of the use of another language as a medium of instruction will largely depend on the status of that language. It makes a difference whether or not it has legal status and whether that status is national or regional. Probability of success may also depend on the international status of the language. If the language is one of wide or extra-national communication, like English or Spanish, the situation is bound to be different from that of a local Amerindian language spoken by only a few tribes.[42]

Language legislation which fails to take into account the linguistic situation and its multiple variables is likely to fail. Language legislators have rarely realized that they are dealing with

linguistic forces -- often beyond their control, that all languages are not equally powerful and that in any given context of language contact one language may have a greater force of attraction than another. Such forces have affected not only officially bilingual countries like Switzerland,[1] but also many of the developing countries [2,3,4]. It is the analysis of such linguistic forces, one would imagine, that should become the starting point of all language legislation, since it is the grouping and power of such forces that will ultimately decide what is possible, what is impossible and the extent to which one can expect to modify through legislation the extension or even the survival of a language.

The feasibility of language policies depends on the optimal use of language forces. A policy may aim for national unity through the preservation of languages and cultures; but the implementation of the policy may be beyond the powers of the government.

Language power is distinct from political power; but it is a force with which politics must contend. Giving political status to a language may indeed create conditions which give it the means to exercise and expand other forms of influence through extensions of its usefulness in education, administration, and other societal activities. It is not however sufficient to grant official status to a language to assure its survival; for there are forces above and beyond political status that decide the fate of languages.

What are these linguistic forces which decide the prestige and staying power of languages? What makes one language attract more new speakers than others? Why does one language often dominate others in situations of language contact? To what extent can we identify and quantify these forces?

These are not simply questions of classifying language communities[5] or of identifying types of national languages, whether they get their power by *abstand* or by *ausbau*; it is an effort to measure the forces ultimately responsible for the life and death of languages. Languages which have had the longest and most abundant lives have also been the most dominant ones, in which most of the world's knowledge has been available -- languages which can easily express and communicate not only what is known but also the new findings of modern science and technology. They are the native languages of countries with the economic wealth and population to be able to diffuse this learning in the form of books, periodicals, films, broadcasts, and to spread this knowledge throughout extensive areas over which the country has some influence. Because of this, these languages develop into very flexible communications media, carrying a varied culture which becomes more and more universal. The power and prestige of such languages as a means of communication are guaranteed by the political and industrial power of the nations using them as national tongues. They are such languages as: English, French, German, Russian, Chinese, Spanish, Italian, and few other

languages. In comparison to these great languages and what they represent, the vast majority of the world's languages have little to offer to the millions who are now becoming literate and will seek access to all that the modern world has to offer in the way of knowledge and information. By acquiring one of the great languages, these millions not only give that language wider currency, but make it economically possible for even more material to be produced in it.

In many small and medium sized nations -- and they form the majority -- educated people have to be able to seek the knowledge they need in one or more of the languages in which most of the world's knowledge is available. This is the reason why King Stephen I of Hungary insisted that a realm with only one language is powerless and frail. And one able to use important languages to acquire its knowledge is all the better for it. It means that a person is educated because he has read widely in one or more of the great languages. It is not surprising that most of these nations give a great deal of attention to foreign language learning, and have always taken language teaching seriously, since on such skill depends the educational level of people, and hence the strength of the nation.

It is in this way that the majority languages become even more widespread at the expense of the minority ones, and the culture and language of smaller groups are sacrificed in return for the advantage of membership in the larger groups -- just as the individual has to give up something in order to be a member of society. As a result, more and more people are tending to be bilingual through the necessity of becoming poly-social, that is, belonging to one group for one thing and to another for another. The better we can understand this process, which is now taking place, the easier it will be for us to avoid the disadvantages resulting from confused allegeances.[40]

It would be prudent to begin with a couple of basic postulates -- to start with some statements which may appear self-evident. First, it is not the linguistic structure of a language that gives it power and prestige. It is rather its function as a medium which permits one to communicate what and with whom one considers important in such matters as education, business, science, culture, religion and amusement. Second, the importance of a language is derived from the people who have used it -- their number, wealth, mobility, economic and cultural production, factors the accumulation of which constitute the innate status or force (F) of a language

In addition to this status, each language has a power that is relative to that of any other language with which it may come in contact. This force of attraction depends not only on the innate status of a language but also on the extent to which it differs from the other language and the distance between the speakers

of the both languages. These differences constitute what we may call the attraction of one language for speakers of another language. For example, even though English -- for demographic, economic and cultural reasons -- may surpass Dutch, it is the latter which has the greater attraction for Frisians. Yet independently of this, English maintains an attraction for Frisians as it does for speakers of other tongues. So that in order to measure the force of attraction of two or more languages and the pressure which one may exert on the other, we must first calculate the status, or language force, of these languages.

1. Linguistic Forces (F)

People generally learn the languages of the nations they most admire and wish to imitate; these languages were not always the same. It is not a question of the inherent worth of the language, but of the cumulated prestige and achievements of the people who speak it. This prestige and consequent dominance varies from time to time. In the twelfth century Latin was the dominant international language; in the thirteenth and fourteenth centuries it was French; in the fifteenth and sixteenth centuries it was Italian; in the seventeenth and eighteenth it was again French; in the nineteenth century it was English. English and French are still leading languages, eagerly sought throughout the world.

Language power (F) could be defined functionally as the sum total investment in time, money and energy that is made for the purpose of learning or preserving a particular language. It can also be described, regardless of interlinguistic distance and geographic contiguity, as the probability that so much investment will be made to master or maintain a foreign, second or regional language.

The motives which fuel linguistic forces are rarely linguistic. They are rather demographic, economic, cultural and generally extra-linguistic. Such motives can be studied; and the demographic power of the native users of any language, their dispersion, mobility, economic, ideological and cultural influences can be measured. It is the sum total of such indicators -- demography, dispersion, mobility, economic, ideological and cultural production -- that can be used to gauge the intrinsic force of a language.

1.1 The Demographic Indicator (D)

When one thinks of the importance of a language, the first thing that comes to mind is the number of speakers. Demographic differences have indeed been used in the past to measure the probability of communication between two groups.[4] When it comes to numbers, one thinks of some 800 million Chinese and wonders why their language is not the most important one in the world -- even though

it includes, outside of the official Mandarin, some fifty main dialects and about a thousand local dialects, more or less inter-intelligible. It is because the influence of the number of speakers, indispensable as it is to the greatness of a language, is in this case greatly attenuated by the weakness of other characteristics such as income, economic production and technology. The economic power of China, for example, has been less than that of less populous countries. In other words, our demographic indicator is a function of the size of the units counted. One measure of such size is income, so that an appropriate demographic indicator for language influence would be the total population (p) times the average income ($\bar{r}$), or simply the total income of all native speakers of the language (see Table I, col. 1): $D = p\bar{r}$

1.2 The Dispersion Indicator (R)

The total power of a language does not, however, depend only on the number and material value of the people who speak it. It also depends on where these people are. Five hundred million people in one spot will have less influence than a hundred million in five places. How can we find an index to measure this repartition (R) of the speakers of a language in such a way as to preserve the concept of the viable speech community? There are many measures of repartition; but what is needed here is one which will not duplicate the demographic indicator, which already takes the total population into account, and one which, at the same time, does not neglect the importance of the size of the communities to be found in various parts of the globe. One way of doing this is to exclude from our calculations the size of the most populous community, which is often but not always the demographic center, and to indicate the way the rest of the population (p) is dispersed.

So that: $\Sigma p - max\ p = Rp$

The value of R can now be calculated by weighting the size of the communities in categories of one to ten millions, one million being the minimum. Communities between one and ten millions (R_1) could have a value of 1 ($1R_1$), those between ten and twenty millions a value of two ($2R_2$) and so on (NR_n). So that,

$$R = \sum_{i=1}^{n} NR_i = 1R_1 + 2R_2 + 3R_3 \ldots + NR_n$$

(See Table 1, col. 2). If minor languages or communities of less than a million are to be brought into the picture the population can be expressed as a fraction of 1:

$(.1R, .2R \ldots .9R, 1R, 2R \ldots NR_n)$

If a more refined formula is needed -- one in which the distance between the speech communities enters into the calculation -- this new dimension can be brought in as a product, that is, the average population of the pairs of communities times the distance (d) between them, the summation of the sequential value of such pairs giving the value of R. If there are two communities, for example,

$$R = d\left(\frac{1R_1 + 2R_2}{2}\right)$$

The general formula therefore would be:

$$R = \sum_{i=1}^{n} d\left(\frac{NR_n + (N+1)R_{n+1}}{2}\right)i$$

It is the sequential distance (d) between each pair of communities that is measured (between A-B, B-C, C-D,... Z-A), that is, between each community and the *next* nearest, one after the other, to complete the circuit. Such a measure, for example, would give a higher dispersion difference between English and Spanish than does the first formula (see Table 1, col. 2).

1.3 The Mobility Indicator

Dispersion however is not the same thing as mobility. If Germans have been more mobile than the French, it is not because their language is official in so many parts of the world. It is because they have traveled widely as tourist, businessmen, students and professors. Yet in 1970, about a million French nationals visited neighboring European countries as summer tourists, while about the same number of Italians went to Northern Europe many of them on temporary work permits. Since the 19th century, however, the most notorious travellers have been speakers of English, especially the Americans, who since the end of the second World War have tended to become almost nomadic. It has been estimated that 40 million Americans change their address at least once a year and that on the average the entire population moves about 14 times in a lifetime.[29] In many cities one third of the population moves every year. It is not surprising, therefore, that more than three million Americans visited Europe in 1970 -- transmitting to millions of European ears the sounds of their dynamic and difficult tongue.

How are we to measure this phenomenon of mobility? We could do so in man-miles or man-kilometers. But how could we ever find out the distance covered by each person who leaves his country? We do know or can find the number of foreign nationals who enter certain countries each year and we also know the distance between countries. It is therefore possible to arrive at a useful indicator which would represent total man-miles of speakers in distances

between population centers. The formula for our mobility indicator (M) could therefore be: $My = \Sigma(n \times d)_y$

n = being the number of nationals of countries with the same official language; d = the distance between the population centers of the countries of these national and each of the countries visited; y = the year (e.g. 1928). For example, although West Germany and France are both adjacent to Switzerland, the number of Germans visiting that country is twice as great as the number of French (see Table 1, col. 3).

There seems to be a relationship between national and international mobility. Americans seem to move three times as often as Japanese and twice as often as the British, since every year about a fifth of the entire population of the United States changes address.[29]

Since figures are taken from nationality rather than from native language, a more refined measure could weight these nationality figures according to percentage of speakers in each of the countries the mobility of whose nationals is taken into account.

1.4 The Economic Indicator (E)

The number and variety of goods and services produced have been used as indicators of the economic power of a nation. Statistics are available giving the gross national product (*GNP*) of most countries. This index is not the same as the total income of the population since the one does not necessarily determine the other; for industry or the State may use profits for investment or for purposes of national prestige abroad. The total income of the Japanese is not the same as the gross national product of Japan. In some countries, where all production is controlled by the state the relation between income and production can be purely arbitrary.

It is true that there are economic indicators other than the *GNP*, but the latter being the most widespread and the most available, it may have to serve until a better one is standardized.

Our economic indicator (E) can be the sum of the *GNP*s of all countries of the same language: $E = \Sigma(PNB)$

In ethnically segmented nations, however, when the *GNP* of people speaking one language is significantly lower than that of speakers of another language, the *GNP* can be weighted by language group. But such linguistic-economic segmentation is not a rule (see Table 1, col. 4).

1.5 The Ideological Indicator (*I*)

Money is not everything, as the saying goes, and this seems to be true for the spread and influence of languages. In fact, certain economic forces can be neutralized by the impulse of a powerful ideology.

The spread of the great proselytizing religions -- Christianity, Mohamedism and Buddhism -- some of them proclaiming the value of poverty -- succeeded in extending the influence of Latin, Greek, Arabic and Sanskrit to the four quarters of the globe.

Christianity helped spread the Latin, Greek, and Syriac languages; Buddhism helped the cultivation of Sanskrit, and Mohamedism, the propagation of Arabic. The great majority of Muslims in Spain, whether Spanish, Arab, or Berber, were bilingual from the 3rd generation after the invasion of 711; they spoke both colloquial Arabic and Romance Castillian.

Although the spread of Islam was often associated with military conquest, its ideological influence remained distinct from it. Stalin's wartime rhetorical question to Roosevelt -- "How many divisions has the Vatican?" -- simply underlines the distinction between ideological influence and military might.

If Church Latin was even more widely spread than Imperial Latin it was largely due to the zeal and organizing ability of the monastic orders which, between the VIth and the IXth centuries, created a wide network of monasteries held together by one language, one ideology, and one culture. But the linguistic empire of Latin was eventually to be challenged by the rising national languages. It has been said that the Wars of Religion were largely wars of language -- that is, wars for the right and means to express the thoughts and aspirations of a new-born secular thinking class. It is significant that the Reformation was most successful in countries whose language was most removed from Latin. For among educated Italians of the time, Latin, it must be remembered, was still a living tongue. And more recently, the religious revival in Wales at the end of the XIXth century contributed greatly to the preservation of Welsh.

The linguistic influence of religions can be intensive as well as extensive. The intensity of belief and practice is likely to vary from one area to another. The practice of Catholicism in Latin America has not had the same intensity as it has in Ireland. And to be a Moslem in Arabia or Turkey has not been the same as being a Moslem in Indonesia. In some countries, religious practices are much laxer than in others. There is also the influence of religious syncretism in many parts of the world, a phenomenon which official statistics do not take into account. For belief in one religion may co-exist with belief in another; for example, certain urbanized Amerindians in Brazil who are practicing Catholicism

also believe in and practice fetish worship. Adulteration of the faith and laxness of religious practices lead to a neglect of the language of the ritual.

All ideologies are admittedly not religious. There are also highly influential secular ones such as Marxism, Leninism, and Maoism, which may indirectly lend prestige to the language of the true texts. Yet, the availability of these texts could also be interpreted as a cultural factor (see below). One cannot put a language which is simply associated with an ideology in the same category as one which is indispensable to the practice of a religion. The Latin language was thus placed in a different category of power when the Church of Rome abandoned it as the international idiom of the Roman Catholic liturgy, thus enormously reducing the power and prestige of a language which for centuries had been one of the world's most dominant.

It would be wise for us to limit our ideological indicator to foreign liturgical languages, that is, to languages used for liturgical purposes by those for whom it is a foreign tongue, or in countries where it is not the major native language of a special community. Our ideological indicator (I) could then be equal to the number of adherents to religions using a foreign liturgical language (AFL); for example, the population using Hebrew in synagogues outside Israel and the number using Arabic in Moslem rituals in non-Arab countries (see Table 1, col. 5). Of course, the degree of exposure to the language depends on the frequency of liturgical participation. About ninety-eight percent of Turks are Moslems, and most of them say their prayers five times a day -- not in Turkish, but in Arabic. This degree of language use is considerably more intense than the past Sunday-exposure of Roman Catholic masses to Latin. But such frequency figures being not always available, we shall have to be satisfied with a less refined measure: $I = \Sigma(AFL)$

1.6 The Cultural Indicators (C)

Another non-economic indicator is the linguistic influence which accompanies the spread of a culture. The great cultural influence of Athens and Rome helped spread Greek and Latin, for two millenia, over the Western World. Yet cultural influence can be independent of military power. Greek rulers in India came up against another great civilization and were eventually Hinduized. The Franks and the Vikings who conquered parts of France adopted the language of those they conquered. In Africa, the Vandals lost their speech to Latin. The illiterate Visogoths learned Spanish and also lost their native tongue. On the other hand, Chaldean priests, during the Second Millenium B.C., outnumbered by the Hittites, Assyrians, Persians and Medes, who successively ruled Babylon, were able, by means of their language, which had been used as an international means of communication, to convert their barbarian conquerors to the civilization of the conquered.

Another difference between military, economic and political power on the one and cultural power on the other, is that the latter is cumulative. Even today in the most advanced technological societies we are still prisoners of the Chaldean concepts of space and time -- of the 360 degree circle and the hour of 60 minutes. Culture is cummulative and remains long after its creators have disappeared. Hundreds of men of learning in Europe were still using Greek and Latin for their best thoughts and writings in philosophy, law, and literature, long after these tongues had ceased to be used as imperial or even national languages. Even the Romans learned the language of the superior Greek civilization which they had conquered, and whenever possible the Romans went out of their way to speak Greek. In fact, some of the more educated tended to introduce into their Latin speech certain features of the Greek tonic system. No Roman who did not know Greek could claim to be educated -- even though Greek was the language of a conquered people under Roman domination. In fact, a period of study in Greece was long an essential part of the education of a Roman. We know that Horace studied literature in Greece and that Caesar and Cicero studied rhetoric there. That is why Cicero was able to address the critical Syracusean senate in their native Greek.[40]

Before attempting to measure the language-related cultural forces, it would be wise to seek a functional definition which could be used as a basis for quantification. As a starting point, we could postulate a relationship between cultural activity and cultural production, between, for example, the number of copies of a work and its possible influence, the number of works read in a given language and the possible influence of that language.

The number of publications in a given language may also be a function of its degree of standardization. No matter what the regional vitality of a creole may be, writers are rarely prepared to produce in it when the standard form is available. A Haitian intellectual will tend to have his works published in standard French. It is also the high degree of standardization of the French language which makes it attractive as a school language in certain countries, in addition to the fact that once this standard language is understood a great wealth of cultural productions -- in science, the humanities and technology -- becomes available. English is in a similar position.

The number of titles or number of copies of all books produced in a given language could well be used as an indicator of the cultural potential of this language. But it remains a potential whose value depends on the extent to which the language is used. The libraries of Europe for example are rich in the cumulative productions of two great languages -- Latin and French. But the number of Europeans capable of using the books in Latin is undoubtedly quite inferior to the number able to read the French books. This is reflected in the fact that the annual demand for French books is higher than the annual demand for Latin books.

If we are to use publication as an indication of cultural power we must take into account both the cumulative effects of the past and the cultural dynamism of the present. The first is reflected in library holdings; the second in book production.

The number of books in the libraries of a country is an indicator of the cultural wealth of that country, even though many of the books may be in a foreign language. This is the most available indicator since most countries keep some sort of library statistics. So that our first cultural index would be the total number of volumes in libraries of countries using the same language (see Table 1, col. 6). A more refined index would be the total number of books in all the libraries of the world classified according to language. But these figures are not readily available. A still more significant indicator would be the total world library circulation by language -- figures also difficult to obtain. For purposes of illustration therefore, we must be satisfied, as one indicator (C_v), with the total number of volumes (V) in libraries of countries using the same language: $C_v = \Sigma V$.

This indicator, however, would have to be supplemented with a second one which reflects actual demand and creativity. One indication of this is the number of books or titles published. This is a feasible indication, since national book production figures are available. Some corrections, such as those for imprints of multinational publishers, would have to be made. But the total number of books produced by any given country gives some indication of its cultural impact and the influence of its language. If all books (B) published by countries using the same language are totaled, the total reflects the cultural influence of that language (see Table 1, col. 7). Our second cultural indicator could thus be simply formulated as: $C_b = \Sigma B$.

A greater refinement in the value of C_b could be introduced by using figures for book production by language, if available, rather than by country, since some countries produce books in foreign languages.

For authors whose native language is a minority language often write in one of the majority languages so that their ideas or discoveries may reach a wider public.[36] This tendency helps put these majority languages in an even stronger position. Much of the scientific literature published in the Netherlands and other technically advanced countries, for example, appears in English, German, and French. About a fifth of all books by Swedish authors are written in English, about four percent in German and about one percent in French. For instance, figures for 1965 were: Swedish titles, 4,241; English, 804; German, 94; and French, 17.[37]

One could of course argue that our cultural indicators of library holdings and book production would include a measure of our ideological indicator -- that is, books for the foreign language liturgy; witness the number of Latin missals produced when that language was the official and international idiom of the Roman Catholic Church. There would be an overlap, however, only if our cultural indicator showed the number of copies; as it is, it indicates only the number of titles of which any religion has a limited number for its liturgy.

One powerful factor in the spread of a dominant language has been the media which it controls -- writing, printing, broadcasting. The invention of writing helped the spread of Egyptian and Babylonian, which, in turn consolidating the Egyptian and Babylonian empires. But eventually their systems of hieroglyphic and cuneiform writing were seen as slow and inefficient. The superior invention of the alphabet helped expand the languages which adopted it, and the more efficient cursive script helped spread such languages as Phoenician, Greek, and Aramaic. Aramaic is a good example of what an efficient medium of communication can do for a language. The Aramean Nomads went into Mesopotamia, adapted a Phoenician-like script, which was cursive and efficient, and as a result, were able to establish Aramaic as an international language all over the East, far beyond the sphere of influence of those who spoke the language. As a trader's script, it was quickly spread by the trade routes and became the language of the courts in some countries. It was used in Palestine, Syria, Armania, and Egypt by the Persians. In Palestine, it even replaced spoken Hebrew; it was used by the elite of Judah to communicate with the Assyrians, and it also became one of the languages of the Bible.

The raw materials on which an alphabetic script could be used was also a factor in the spread of a language. A supply of papyrus, for example, helped spread a knowledge of the Greek language. For a long time, Alexandria had an abundant supply, almost a monopoly, of the product. This permitted Hellenistic Greek teachers to mass produce their texts by scribes working as slaves.

Centuries later, the invention of printing was used to disseminate works, not only in the classical languages, but also in the rising vernaculars. This helped stabilize these national tongues, fused the principles of language standardization and nationality, thus uniting diverse groups. To be profitable, of course, printing required a fairly large public. This feature also favoured the publication of books in the vernacular, and these soon outnumbered those in the classical languages. This in turn favoured the learning of such modern languages as Italian, French, and English, instead of Latin and Greek. With the increase in literacy, it is the language of what is most available in print that people want to learn. Today this favours the spread of the great languages of the world.[40]

Book production is not of course the only indication of cultural activity. A people may be highly productive in many other areas such as cinematography, radio and television broadcasting, productions which enable people to hear their language. An effect analogous to that of printing is produced by the medium of the motion-picture film. Because of the high cost of professional productions, the cinema will favour languages of wide diffusion, eventually eliminating a number of firms producing in languages of limited use. Radio and television are other media which help enhance the languages of nations who use them. It seems that long distance broadcasting and the satellite communications of the future will also favour the spread of the great majority languages.

Such an indicator, however, may be a function of economic power, as is the production of mass media, like recordings, films, videotapes, radio and television broadcasts and communication satellites. If it costs a thousand dollars a minute to produce a broadcast quality videotape original and only four dollars a minute to use it, it is not surprising that the television stations of the world find it more economical to buy pre-recorded program packages, even though these may be available in only a few dominant languages. The process begins with programming for the elite who can afford a television set and also happen to have the type of schooling which has enabled them to understand one of these dominate tongues. Yet even with dubbing into the vernacular, foreign cultural values, canned in a powerful foreign country, are nevertheless transmitted through television screens in all quarters of the globe. The same is true for films and other costly media. In this way, the so-called free flow of information always follows the strongest current. If the correlation between these oral media and the written media are high enough, the latter may still be the more useful indicator.

There are, of course, other types of cultural production, such as sculpture, painting and music; but they are not language related. It is possible to enjoy foreign music, foreign painting and foreign food without necessarily learning a foreign language, although such enjoyment may well dispose us favourably toward that language.

We have selected indicators from six areas of possible language power -- demography, dispersion, mobility, economical wealth ideology and culture. Those selected are not the only possible indicator, however. We could have used such indicators as literacy, urbanization, educational level, newspaper circulation, political stability, population homogeneity, mail, number of telephones and radios, number of theaters and cinemas, incidence of crime, level of employment, mortality, marriage rate, property distribution, social security, confessionality, exports and imports -- and any of about a hundred such measures.

The indicators chosen, although they will still have to be justified, seemed both feasible and language-related (see Validation). Indicators must of course be selected for the purpose we have in mind. The purpose may be political, descriptive[9] or comparative.[10] On the other hand we may be interested in ethnic components[11] or in social, cultural[12] or economic comparisons.[13] The method used in exploiting such indicators has been to calculate correlations between them in order to establish such general traits or political stability, economic independence and democratization. It has been possible to establish some constant associations between certain levels of political and social activity.[14] A high correlation has been noticed between urbanization, literacy and political participation.[15] There even seems to be a correlation between some of the indicators we have used and those we have omitted. A positive correlation (of .888) has, for example, been established between the *GNP* and education, between the *GNP* and the number of engineers and scientists (.883), of doctors and dentists (.700) and of teachers (.755).[15]

These have been used to indicate differences between countries. Here we are interested in correlations to help us establish differences between languages -- external and measurable. Differences between political units are useful to us only in so far as they indicate the relative power of the external characteristics of languages -- regardless of political boundaries.[16] In other words we are not interested in political frontiers but in linguistic ones.

The power of each external characteristic of a language varies in space and time. It does not have the same value within all countries and during all ages, but depends on the social control of military, religious, government and economic forces that may exist in any place at any given moment. In contemporary industrialized states, for example, as the role and control of government increases -- through the operation of such organisms as public utilities and regulatory agencies -- political power, as opposed to economic power, becomes more and more important; so does the language of the group holding the political power, if it happens to be different from that of the economically dominant group. Witness, for example, the changing language status, between 1950 and 1970, in the city of Montreal -- where the English language has dominated economic life, and the French language, the political life of the area -- as the Quebec government has taken a more and more active role in things affecting the individual within the state -- health, welfare, education, insurance and public utilities.

Although the number, type and weighting of such indicators will have to be rigorously determined (see Validation below), we can still advance a general formula for the measurement of linguistic force (F):

$$F = \sum_{i=1}^{N} X_i^x$$

That is, the sum of whatever number (N) of comparable and weighted indicators (X^x). By way of illustration, we have used the following indicators: $X_1(D)$, $X_2(R)$, $X_3(M)$, $X_4(E)$, $X_5(I)$, $X_6(C_v)$, $X_7(C_b)$.

Perhaps our correlation will permit us to use only a single indicator -- or very few of them. But the closer we are to the community level the less value will the correlation be. For example, in measuring innate language power, a high correlation between book production and newspaper circulation may enable us to eliminate the latter. But if we are interested in language pressure at the community level, both indicators count, since they all have a cumulative effect (see Pressure below). The same holds true when we study the force of attraction between two or more languages.

2. Language Attraction (A)

The different status of languages can be seen when they are in contact. The difference shows up as a component in the attraction or repulsion which one language -- or rather those who speak it -- may have for the other language. But it is not the only component; there is also the geographic distance which separates the groups and the amount of difference between the languages -- the interlingual distance. The attraction of one language for another depends, therefore, on the differences in status, in territorial distance and in interlingual distance.

2.1 Status Attraction ($F_{a/b}$)

The attraction of one language for another does not depend on the intrinsic power of each but rather on the amount of difference in their language power. French and German, for example, are two great languages of comparable status; but there is likely to be less attraction between them than between either of them and a less powerful language like Basaa, a language which attracted neither the German nor the French colonizers of the Cameroons, where it was rather the speakers of Basaa who mastered, successively, German and French. It is that these two languages are to a great extent self-sufficient, in the sense that speakers of either can realize most of their aspirations in their own language.

How can one calculate the relative power of two languages? One must first identify the languages and dialects which enter into a situation, whether it be one of language learning, language contact, or language use as, for example, a medium of instruction. It is important that all languages and dialects in the situation

be accounted for in order to divide the amount of attention they attract into the right proportion. Although most situations are likely to involve two languages, others may include three, four or more. By way of example we shall use only two languages. If one of the languages is used, for instance, by a population of 90 million and another by a population of 10 million (a combined total of 100 million), the demographic proportion is, of course, 9 to 1 or 90% to 10% -- a difference of 80%. By thus reducing our language power (status) indicators to proportions it is possible to calculate the degree of difference in language power of any combination of languages. Each indicator (X), which may or may not be weighted (see above), can be expressed for each language as a proportion of the combined values of all the languages involved in the situation (Languages a, b, c...). The degree of difference for two languages can be expressed thus:

$$X_{a/b} = \frac{a}{a+b} - \frac{b}{a+b}$$

(a being the figure obtained for Language a according to the indicator (X), and b being the corresponding figure obtained for Language b). To make the differentials comparable it would be wise to express $F_{a/b}$ as a percentage, that is, by a figure whose maximum is 100.

2.2. Territorial Attraction ($T_{a/b}$)

The attraction which one language can have for speakers of another language or dialect will depend on the probability of reciprocal or non-reciprocal (reading or hearing the language) contact. Even a powerful language can have little attraction for a people who have no possibility of ever hearing or even reading the language. In other words, the force of attraction of a language, is increased by contiguity and decrease by distance.

People have always been influenced by their neighbours, and this influence has often been linguistic; they have been less influenced by distance strangers -- even the most powerful ones. The Finns of Finland are much more likely to learn Swedish than they are Spanish; but Finns in Brazil will be more likely to learn Spanish than they will Swedish -- after, of course, having learned Portuguese.

The attraction of contiguity has itself been attenuated by the presence of natural barriers -- mountains, lakes, and rivers -- factors which have been invoked to explain the different degrees of divergence within the same family of languages -- as, for example, the Latin-Romance family.[17] It may be that the increased facility of communication has reduced the effect of such natural barriers. There are however artificial barriers created by inviolate political

frontiers and a policy which reduces by force all communication from and to the outside. There always remains however the constant of terrestrial distance (T).

The quantification of terrestrial distance between linguistic groups is not without its problems. National boundaries are not always congruent with language boundaries. There are often wide transition areas between one language and another. The distribution of the population speaking one language may be quite different from that of the other language; it may be diffused or rural in one case and concentrated or urban in another. Terrestrial distance between different language groups must therefore take into account not only the distance between language frontiers (f), but also the distance between population centers of gravity (g).[9] By averaging the two distances we obtain a truer measure of the distance between peoples. For example, if we have three language groups (a, b and c) whose population centers are equidistant (120 miles or kilometers) but whose language boundaries are not (a borders on b, both being 120 miles -- or km -- from c). The difference between the terrestrial distances from a, to b and to c would be:

$$f(a \rightarrow b) = 0 \qquad f(a \rightarrow c) = 120$$
$$g(a \rightarrow b) = 120 \qquad g(a \rightarrow c) = 120$$

$$T(a \rightarrow b) = \frac{f+g}{2} = \frac{0+120}{2} = 60$$

$$T(a \rightarrow c) \quad \frac{f+g}{2} = \frac{120+120}{2} = 120$$

Terrestrial distance diminishes the force of attraction which one language can have for another. Suppose for example that in relation to Language a (above) Language b and c have a comparable demographic status, that is, the population of speakers of Language a is nine times greater than that of either b or c and that there is, in both cases, an 80% difference in favour of a:

$$a - b = 90\% - 10\% = 80\%$$

$$a - c = 90\% - 10\% = 80\%$$

On the face of it, a would be equally attractive to b and to c. But since it is twice as close to b as it is to c, on the basis of the above calculation it would be twice as attractive to speakers of b as it would to speakers of a. Mass differences tend to increase the attraction. In other words both together would tend to follow the general interactance hypothesis of the attraction of groups to masses.[34] Applied to population movement, the hypothesis states that the number of persons going to a given spot varies directly with the force of attraction of the receiving area and in-

versely with the square of the distance between the source and the terminal. The basic formula was suggested in the late twenties.[35] It can be generalized as: $N = \alpha X/Y^2$, where N is the number of people moving, X (attraction) and Y (distance) are independent variables, and α is a constant of proportion. X and Y have been variously defined as "intervening opportunities" and "shortest highway distance" -- both yielding reasonably accurate results when demonstrating the use of the formula to predict such phenomena as the convergence of large and scattered rural populations toward urban centers.

The square of the distance (Y^2), however, was found to be more accurate in small regions than in large ones. In fact, the power to which distance (Y) should be raised is inversely proportional to the size of the regions. The formula has been applied mostly to the prediction of population movement between two urban centers, notably by Stouffer and Zipf. Stouffer's formula (M/IM) predicts the number of migrants traveling to certain distance bands, defined as "total intervening opportunities," in turn defined as "total in-migrants."[32] This circularity of definition has always assured a high degree of accuracy in the application of the formula. Zipf's formula (P_1P_2/D, on the other hand, multiplies two real populations (P_1 and P_2) and divides the product by least distance in highway miles.[33] Although results have been both accurate and significant, the formula fails to predict the direction in which people will move, and it also fails to take into account differences whereby people are attracted to areas with more and better jobs.

Thirdly the significant variable here is not really distance at all; it is accessibility. If a highway is opened up through an isolated speech community and the incidence of automobiles in the surrounding areas is known, as well as the interaction patterns in community behavior, one could estimate the increased effects on the area's language contact patterns.

Fourthly there are factors which modify population movement, including the very cost of the movement (C), the time factor (T), the income differential (R_1-R_2) and the type and number of goods and services available (G). Interaction is also affected by the position of areal units in the hierarchy of administrative links in business and government, so that one area may rank merely as a leaf on the administrative tree while another may house the headquarters of a giant enterprise. One town may function as a focal point containing the area's primary supply depots -- a primary city -- as such points are sometimes called. They can be weighted in proportion to their measurable importance.

Finally, in lightly nucleated areas (villages and hamlets) the language interaction is likely to be different, not only in degree but also in kind, from that occurring in either the sprawling suburbs or in the congested inner city, where most social roles

are likely to be so structured that a person who may never have met his next-door neighbor, can have many friends in the associations -- labor, business, religious or ethnic -- in which he functions.

It would seem reasonable therefore to assume that language-related variables will include, not only population (P), but differences in average income (R) and per capita goods and services $\bar{G}X$. They may also include a measure not only of mere distance, but of the more relevant travel time (T) and a travel cost index -- cost per hour of travel as a percentage of average hourly income ($\bar{C}$). In other words, the attraction of P_2 for P_1 ($A_{2>1}$) is equal to the difference between the population of P_1 and P_2 in terms of average income ($\bar{R}$) and per capita goods and services (over the cost of travel from the source (2) to the terminal (1) in terms of average hourly income ($\bar{C}$) at the source ($\bar{C}_2$) multiplied by the corresponding travel in hours (T). That is:

$$A_{2\to 1} = \frac{(P\bar{R}\bar{G})_1 - (P\bar{R}\bar{G})_2}{T\bar{C}_2}$$

In applying such a formula at the local level one would have to take into account the geographical distribution of jobs, goods and services. People commute to make money and to spend it. If the rural population speaks one language and the urban population speaks another, the fact that more and more rural workers must work in cities increases the attraction of the dominant urban language. Witness the Anglicanization of the Welsh population from rural southern Wales as a result of the industrial revolution in the 19th century, and its parallel in rural French Canada in the 20th.

The degree of attraction of a center may be measured in terms of goods and services offered. With this as a criterion, it is possible to arrange centers according to commercial magnitude -- ranging from the hamlet to the large, primary city. Seven degrees of magnitude have been suggested (see Table II).

If all the primary and secondary cities are in one language area, they will attract people from other language areas who cannot otherwise obtain the goods and services they desire, thus creating a certain amount of linguistic dependence. Linguistic independence, on the other hand, and language maintenance as well, are promoted by having primary and secondary cities within each language area (see Maps). This is especially true where the urban centers have a high concentration of people speaking the language of the area (see Table III and Figure 1).

Primary and secondary cities also tend to create jobs, attracting workers from the surrounding rural areas. Some workers may have to travel daily to work over long distances. These distances can themselves be used as an index of the rate of urbaniza-

tion (see Table IV). A sudden increase in the number of long distance commuters in a rural non-farming population would indicate that the area is becoming urbanized. In small towns, the number of people employed in a single plant might be greater than the entire population of the town. As new jobs become steadier, however, the rural workers tend to move closer to these jobs, thus swelling the population of the cities with a corresponding decrease in the population of the rural areas.

Contrariwise, as urban pressures mount in the big cities, people tend to move to nearby rural areas to seek more living space, with cheaper land, lower taxes and freedom from building codes. This movement may further dilute the population speaking the other language. Either way, a high incidence of long-distance commuting generally indicates that the surrounding area is being drawn into the urban economy. An increase in long-distance commuting may also bring about a decline in rural community services; for people used to travel long distances to work will readily travel similar distances for services. Social functions of small ethnic communities also suffer when commuting workers, having made friends at work, are no longer interested in taking part in local activities. The practice of seeking services outside the neighborhood also affects the availability of such services -- and this may be especially disturbing when an ethnic community finds itself deprived of medical and educational facilities.

The attraction of language-related rural communities -- with the physical inconveniences which they often imply -- is usually not strong enough to resist the drawing power of the well-developed urban centers, with all the facilities which they have to offer. But the force of the attraction, which depends on the distance, also depends on differences in language power.

How can one integrate distance with language power? One way is to reduce both to percentages. We have done this for differences in language power. Let us do the same for terrestrial distance, first on a global scale.

By scaling terrestrial distance between the minimum (0) and the maximum (half the circumference) we have a range of 0 to 12,451 miles. Dividing this into 100 units of approximately 120 or 125 miles, we get a scale from zero to 100 which is comparable with our percentage differences. On this scale the above distance between language groups a and c would be about one unit of distance (120 miles), reducing the power difference (80) on a global scale by about one unit:

$$F_{a/c} - T_{a/c} = 80 - 1 = 79$$

To maintain our maximum at 100 for comparative purposes we would have to divide this by two:

$$\frac{F_{a/c} - T_{a/c}}{2} = 39.5$$

2.3 Interlingual Attraction ($L_{a/b}$)

Up to this point we have been dealing exclusively with the external features as the indicators which largely determine the power and attraction of languages. But there are also internal differences which are by no means negligible. For the very resemblance of languages or dialects can in itself constitute a force of attraction. It has been pointed out, for example, that Italians seem to have more affinity for French whereas Germans are more attracted to English.

The quantification of linguistic differences (interlingual distance) is a highly complex matter since it supposes not only the juxtaposition of two or more systems of systems but also of two or more transformational mechanisms between each system and the corresponding chains of discourse.[18]

There are as yet no indices of the degrees of differences among the languages of the world. One could attempt to use some simply soundings such as those practiced in glotto-chronology where a small set of highly frequent words is compared with the equivalents in one, two or more other languages. The proportion of equivalents with different forms gives the degree of divergence. If this technique, which has been used to study the temporal distance between genetically related languages, can be validated for the measurement of the degree of inter-intelligibility of unrelated languages, it could become a usable indicator of interlingual differences.[19]

Just as geographic distance diminuished the force of attraction between languages, so does interlingual distance. Conversely, the closer the languages in geographic and interlingual distance the greater the attraction exerted by the imbalance in language power. Maximal attraction is exerted by a powerful highly standardized language along a language boundary shared by one of its weaker dialects. The dialect speakers will tend to learn the standard language; but not vice versa. Minimal attraction will be found between two weak languages such as Aranda (Australia) and Micmac (Eastern Canada) -- languages separated by a great geographic and interlingual distance.

Most situations are, of course, not so simple as these extreme examples might indicate. Contiguous languages may not at all interact because of the effects of deviance from a majority or elite standard.

The very power of a highly standardized international language may crush the status of its own dialects -- preventing them from having any influence which the attraction of contiguity might lend them in situations of language contact. This may put a dialect community in a position whereby the pressure from neighbors learning the standard version of their language forces them to modify their dialect in conformity with the standard. In other words, their language can only exert its attraction of contiguity if it is made to conform to the standard language -- or at least to what potential learners and those who advise them assume the standard language to be. In part of Western Canada, for example, the influence on the English-speaking population of neighboring French-speaking communities has been negligible even though the majority of secondary school students elect to study French as their only other language. They are influenced to do so, not by the presence of a neighboring French-speaking community, but rather by the international influence of French which they believe to be imbibing in its purest form, and not in the form spoken by their neighbors, which, they are told, is not "real" French. So that the more enthusiastic they become about the French language the less attracted are they by the language of the neighboring community; and they express a fear of contaminating their French by dialectical forms, or most often by the very words of their own English which their French-speaking neighbors have adapted. Sensing this, the French-speaking community, in order to gain status, through their language, with their neighbors, may make an effort through education to have their dialect conform to the international standard. The means to do so through their schools may however be refused by the English-speaking majority.

The diminishing influence of a dialect of a powerful standard is a function of terrestrial distance. Even when the interlingual distance is zero, geographic distance must be taken into account. Take for example the fate of the language of the Huguenots.[20] They left France after the Revocation of the Edict of Nantes, and it seems that the further they went the less French they preserved. The few hundred Huguenots who settled in the Cape of Good Hope region in 1688 rapidly lost the use of their language, despite the fact they constituted at that time almost a third of the population of the Dutch colony. Huguenots who emigrated to Prussia, however, even though they constituted only a tiny fraction of the total population were able to preserve their French for many generations -- so much so that, the French college which they founded in 1689 was able, in 1964, to celebrate its 275th anniversary.[20] Geographic distance may not, of course, have been the only directly responsible factor in the different fates of these two language groups. It is well known that the Grand Elector of Prussia, in his Edict of Potsdam of 1685, formally opened his country to Huguenot immigration while encouraging the maintenance of their language,

whereas the Dutch authorities on the southern tip of the African Continent and far removed from the international influence of the French language discouraged its use by the Huguenots, while welcoming them as religious refugees.

We have already seen how two determinants of language attraction -- status difference and territorial distance -- can be integrated into a single measure. What now remains is the integration of this third measure -- interlingual distance. Taking up the same example of Languages *a*, *b* or *c*, let us see how this can be done. If Language *a*, as exemplified above, is 80% more powerful than *b* ($F_{a/b}$ = 80) the actual attraction of *b* to *a* will be determined not only by their geographic closeness but also by the degree of resemblance between the two languages. If the geographic distance between the two languages ($T_{a/b}$) reduced the potential of the influence of Language *a* or *b*, as we have seen above, by 1%, the power of attraction remains at 79%.

$$(F_{a/b} - T_{a/b} = 80 - 1 = 79\%)$$

Let us now suppose that the interlingual distance ($L_{a/b}$) between *a* and *b* is 20%; the percentage units based on validated equivalents (see below) would give a similarity of 80%. This difference would reduce the attraction of *b* for *a* by another 20 points, giving 59 as the remaining figure. This method of calculation thus makes provision for negative values, as would appear in the case of Aranda and Micmac. We could argue that the degree of similarity (e.g. 80%) proportionately increases the attraction. To keep the results in terms of percentages we could add this to the remaining 79 and divide by 2

$$\frac{79 + 80}{2} = \frac{159}{2} = 79.5$$

The general formula would then be:

$$A_{/a/b} = \frac{\frac{F_{a/b} - T_{a/b}}{2} + L_{a/b}}{2}$$

Language attraction may be observed at the national and international level. At the local level, however, the component values are likely to change. The international status of English is not directly perceived by the Acadian worker, for example. He feels however, or is made to feel, that he is up against a powerful language. In addition to all these general forces of the language its function in the immediate environment of language contact constitutes a number of pressures on the individual and on the weaker or minority group in a situation of language contact.

3. Linguistic Pressure ($P_{a/b}$)

When the territorial distance ($T_{a/b}$) as we have defined it, gets below zero, that is, when there is contact and interpenetration of two or more language groups, language attraction becomes language pressure. The imbalance of linguistic forces ($F_{a/b}$) constitutes a social imperative or pressure on the minority to adopt some of the characteristics of the majority -- through various traits of bilingualism such as conceptual acculturation, diglossia, shift of home language, linguistic borrowing, bilingual interference. The greater the imbalance, the greater the pressure; and the closer the languages, the quicker the effects.

There are factors which tend to strengthen the demographic pressure of one group or the other. These have to do with the relative wealth of each language group, its power and prestige. It is true that if the difference in these elements is great enough, it may succeed in making the minority actually superior to the majority. If, for example, 20% of the population are masters, and 80% are slaves, it will be the slaves who will learn the other language. In some of the Arab armies which invaded Europe at the beginning of the VIIIth century of our era there were really only a few hundred Arabs, but thousands of Copts and Berbers. Yet it was Arabic, and not Berber or Coptic, that became the second language of the conquered countries. By the year 750, all slaves in the Arab armies were required to learn Arabic. After the conquest of England, the fact that virtually all posts of any importance were taken over by the French-speaking Normans contributed to the bilingualism of many Anglo-Saxons and the preservation of the French language in England until the period of the Hundred Years War. We all know the lasting effects which these generations of bilinguals had upon the English language, the vocabulary of which is still very French.[40]

For the minority of Norman overlords, scattered throughout England, made it necessary for all those needing to communicate with them to do so in the French language. The process can be observed in action in any community where there is a dominant language minority. For example, reversing the language roles and substituting business managers for medieval overlords, the same linguistic relationship has been observed in rural Quebec. According to the personal experience of a prominent Canadian cabinet minister, when he was the local labor leader in a village in the Lac St-Jean region of Quebec, the only English speaker was the manager of the local mill who, after fifteen years in that post had learned no French. Yet he was able to compel the entire village to speak to him in English.[39] The same assumptions of language dominance were observed in the behaviour of English managers in Welsh towns during the 19th-century industrialization of Wales. Some minorities can be linguistically dominant; for language pressures are not exclusively demographic.

Anyone living in an area of language contact is likely to be exposed to various linguistic pressures according to the direction and degree of attraction between the languages. The cumulative effect of all the linguistic forces -- immediate and remote -- constitutes, as it were, a pressure which shapes the language behavior of groups inhabiting areas of language contact. What are some of the behavioral traits associated with these pressures, and what are some of their effects?

3.1 Behavioral Traits

If an individual lives in a community of intimate language contact, he cannot easily remain indifferent to the linguistic pressures which surround him. He is bound to be faced with decisions which may modify his everyday behavior. In which language is it better for him to work?[21] To what extent are his world of work, his education, his local and national government, his radio and television programs dominated by one language rather than the other? other?[22] In which language does he obtain most of his information about his immediate environment and the outside world? Such questions directly affect the language behavior of the individual.[23] This behavior can very well be described as a network of linguistic acts surrounded by the pressures which shape them. For it is in large measure the fruit of cumulative linguistic forces, such as already defined -- demographic, geographic, cultural, economic, educational and administrative -- applied at the global, national, regional and local levels.[24] It is therefore as an extension of the linguistic forces (F) that we can measure the pressure (P) of one language upon speakers of another language. The simplest and most comparable way to do this is to express the pressure of each language (a and b) as a proportion of the total force, by combining the figures obtained for both language ($a+b$), according to each indicator, and by summing the differences:

$$P_{a/b} = \sum \left(\frac{a}{a+b} - \frac{b}{a+b} \right)$$

As an illustration let us take the linguistic pressures to which Acadians in the Moncton area were exposed in the year 1961 (see Table V).

One of the deepest effects of such pressures is their shaping of the conceptual world of the individual and the group, that is, the changes to be observed in the acculturation of concept categories.

3.2 Concept Acculturation

The individual and the group in areas of language contact may undergo an imperceptible verbal influence whose long term and cumulative effect is to be observed in the way concepts are formed and labeled.[25]

To illustrate this, we examined through sets of controlled word association tests some of the concept domains of forty-one ten-year-old Acadians with French as a home language, living in the same bilingual area and undergoing the same pressures from both English and French. To each we administered ten tests, each of 15 minutes duration, covering five conceptual domains, namely: actions, instruments, transportation, religion and sports. The tests were given in French, and three months later in English. In each test, the subject supplied all the words he could write on the domain tested within the allotted time. The most obvious result was that, no matter in which language the subject was supposed to be thinking and answering, the combined lists of words in three of the domains were to a certain extent bilingual. In other words, certain concepts were associated with one language rather than the other. The number of concepts so associated depended on the cultural domain; religious concepts were associated with the French language, whereas concepts of transportation, instruments and sports tended to be associated with English, indicating a degree of conceptual acculturation. It was as if this little group was undergoing selective pressures from both languages so that in each domain one of the languages was dominant. And the extent of the dominance varied according to the domain; the greatest degree of English dominance was, for example, in the domain transportation -- particularly the automobile.

For each domain the degree of conceptual importance which each language represents in the minds of the member of a group can thus be measured. Three first-order variables are available from the test results: i) the total number of words, that is, of word occurences (tokens) for each language in each domain (see Table VI, line 1); ii) the number of different words (types) in each domain and for each language (see Table VI, line 2); iii) the number of word types in each list which belong to the other language, e.g. English words in a French list (see Table VI, line 3). This enables us to calculate the degree of linguistic interpenetration and concept acculturation (see Table VI, line 4).

By plotting the results on two interfacing scales, we can easily visualize the extent of conceptual interpenetration in each domain. Flanking this picture of the effects of linguistic acculturation with another interfacing pair of scales illustrating some probable causes (Table V) we get a model of language pressures which a community can undergo when faced with two languages of unequal power (see Figure 2).

This, of course, is only an illustration of a possible model based on a number of possible indicators. Before using it as a basis for large-scale surveys it would have to be validated through several phases of experimentation. One would also have to determine which pressures affected which domains in order to discover the most significant domains for testing, and within each, establish appropriate measures such as rank-order and type-token ratio.

4. Validation

Plausible as they may seem, these geolinguistic concepts of power, attraction and pressure still have to be validated. If we can prove that language power and attraction can be something other than political power and that they can exist independently from the power of any single nation -- although this may well contribute -- we are yet faced with the problem of validating our selection of indicators to find the right ones, the most efficient number and the correct weights of each. We must also seek to integrate these into single measures for language power, language attraction and language pressure.

4.1 The Validation of Language Power

Language power can be considered as that set of forces or motives which make people use one language rather than another. In this respect some peoples are more linguistically independent than others. They really have little need to learn other languages in order to maintain their economic and political power and prestige. Their languages are largely self-sufficient unto themselves. Other nations, though less powerful, can maintain a high standard of living by making maximum use of what is available in the languages of their powerful neighbors. Their linguistic dependence is no indication of subservience: in fact it can assume a certain economic independence. Yet it is a reflection of diminished power -- demographic, political, or economic. The need ranges from an almost complete dependence, in cases where there is not enough material in the language to insure even a most elementary education, to cases where only advanced university students must have recourse to material in another language.

Do some people who speak one of the dominant languages as a mother tongue have any need whatsoever for another language? Since their home language is at once the language of the country in which they live and work and a language in which all the knowledge they may need is available, a language spoken and understood in many countries where they may wish to travel, what need do they have for any other language? Because of these considerations, such people tend to harbour exaggerated notions of the importance of their native language. This linguistic chauvinism often annoys those who have gone to the trouble of learning the language as a second lan-

guage besides their own, perhaps less important, mother tongue. If Dutchmen learn English, why don't the English learn Dutch? Is it because the English language is better than the Dutch language? It is true that English may be a great language -- for many reasons -- but none of these are linguistic. As a language, English is no more important to the linguist than is any one of some three thousand other languages spoken in various parts of the globe. Moreover, no language has a monopoly of all the world's knowledge. It is for this reason that Milton urged the English to study Italian, the dominant language at the time; both Queen Elizabeth and Mary Stuart wrote dispatches in it.[40] If we could use measures of linguistic dependence and independence as indices, it would be possible to find out the extent to which our non-linguistic indicators reflected language power. An obvious indicator of linguistic dependence would seem to be the necessity to make use of a language other than that of the country, especially as a source of necessary or useful information. For example, much of the technical and creative literature available in a given language might be in the form of translation from another language. The relative amount of such literature produced would give some indication of the linguistic dependence of the people producing it. Of course, it is the proportion, and not the total that is indicative, since some of the most dependent peoples produce the least. Conversely, countries which publish much are not necessarily independent linguistically. Although the very ability to produce and publish translations is an indication of cultural and economic power, the proportion of such translations is an indication of linguistic dependence. If most books in a given language are translations from another language, it is an indication that more of the books worth producing are written in that other language; and if there are enough of them, this very fact might incite people to learn this other language in which so much interesting work is available. In addition to our indication of cultural power therefore we need an indicator of linguistic independence or dependence (L_d). This can be stated as the proportion of books (B) produced as translations, that is, where the language is the target language (T):

$$L_d = \frac{\Sigma T}{\Sigma B}$$

If the result is 1, as it would be in some language whose literature is limited to translation of portions of the Bible, it would indicate complete dependence. A further and more refined validation, which would be expected to be inversely related with the above, would be an index of linguistic independence (L_i)

We could measure independence as the extent to which a language is used as a source, indicating cultural productivity in that language, in contradiction to the use of the same language as a receiver or target language. A language used more as a source than as a target shows that much more linguistic independence. By

subtracting the percentage of the annual book production representing translations from another language, that is, where the language is the target language (T), from the percentage of the annual production of other countries where the same language is the sources (S), we obtain an indication of linguistic independence (L_1)

$$L_i = \frac{S}{S+T} - \frac{T}{S+T}$$

For example, if we substitute (E) -- English -- for (L), we would take the total number of titles which are translations from the English (S) as a proportion of total titles translated in both directions ($S+T$) and from this fraction substract the total number of translations into English (T), also as a proportion of total translated titles, we should probably get a plus figure. If however, we do the same for a language like Cree, we would probably get a minus figure. This minus figure would indicate a degree of dependence, whereas the plus figure indicates the degree of independence (see Table VII). Distinguishing indicators of language power from indicators of language independence gives us the dependent and independent variables to test the significance of our measure (Table VIII).

It is important, however, that each indicator be as autonomous as possible. Using a demographic indicator which includes average income, along with the GNP, would give too much weight to the economic variable. Likewise using both library holdings and book production gives too much weight to the cultural variable. We must therefore limit our indicators to one of each -- demographic, distributional, mobility, economic, ideological and cultural. At the present state of our knowledge, it is impossible to give different weights to these indicators without being arbitrary. Yet, if we wish to handle them together it is necessary to reduce them to comparable scales. We can do this by reducing them to standard indices through the use of an appropriate formula (see Table IX).

We can then calculate for each indicator separately, and for all together, the correlation between language force (F_1) and linguistic dependence (L_d) and independence (L_i) (see Table X). We might then be able to state that:

$$F_1 = \frac{1}{L_d} \text{ or } F_1 = L_i$$

Another manifestation of a language's influence is the number of people learning it as another language. If the choice of this other language is free, we can rank-order for each country all languages according to the number of people learning them. We can also find the percentage or proportion of people learning one language rather than another. For example, in the decade between 1938 and 1948 in England more than 90% of secondary school students

learning another language had chosen French. The proportion of those learning German and Spanish was much less; for every hundred studying French about 17 (17.4 to 16.6) had chosen German and only about 2 (1.8 to 2.7) has opted for Spanish.[28] It is possible to calculate the approximate percentage of a population studying another language and the proportion for each language. By totaling the populations for all countries according to language we can get an idea of the world total for each language.

In the case of interintelligible languages or dialects, however -- like certain varieties of Spanish and Portuguese -- a criterion of passive or non-reciprocal usage might be preferable. Witness, for example, the learning of English as compared with the use of Spanish in Brazil.

In the case where the choice is not free we must calculate the number of persons whom the authorities oblige to study a language as their first foreign language, and also, as the case may be, as their second or third foreign language. It may be that the role of propinquity is also a function of population mobility. The combined figures (F_2) could be used as a basis for correlation with the selected indicators.

Another variable for correlation (F_3) is the number of people using a language as a working language in countries where that language is not a national tongue. For example, certain international agencies and national or multinational corporations use a foreign language as a working language -- even in unilingual situations where all workers have the same native language. This is true in a number of European countries like Switzerland, Finland and Sweden where English has been used as a working language. History provides several other examples, such as the use of French by the Russian aristocracy in the 19th century.

A fourth variable (F_4) can be obtained from the measurement of linguistic attitudes through administration of attitudinal tests to representative samples of population. Since, however, attitudes may be positive or negative and may vary in intensity this variable would also provide indication of external linguistic weakness as well as strength.

In sum, there do exist manifestations of language status, of language power or force, or whatever we wish to call it (F_1, F_2, F_3, F_4...); and we can describe these as the effects of multiple causes or factors which may influence the choice of a language and the amount of investment which people are willing to make to master or to maintain it.

How many of these factors are there? We could name about a hundred (see above). But they are probably not equally valuable

as indicators of language power. That is, they will not predict equally well the balance of translation (F_1), the choice of another language by a group (F_2), its use as a working language (F_3) or a positive attitude toward it (F_4). We must find which of these many factors are the most reliable indicators. We can do this by determining which ones give the highest correlations, and proceding by factor elimination, retain the optimum number of dependent and independent variables. One must not forget, however, that the factors which influence language choice tend to have a cumulative effect. For the more a language group or ethnic community has in common, the greater its resistance to assimilation and acculturation. Witness, for example, the survival of Jewish communities in all parts of the world. The greater the number of factors favoring a language and the greater their cumulative value, the greater the resistance of the language. The greater the value-agglutination the stronger the ethnicity. The type of correlation necessary to justify the elimination of a factor is a bi-directional one: either x or y can be eliminated only if x supposes y and y supposes x.

We retain only the indicators which best predict the value of F, so that an increase in their value is always associated with a corresponding increase in the number of people learning the language, or the number of states that require it, or an increase in attitudes favoring the language.

In thus measuring the relationship between the external characteristics of a language and indications of its influence, two problems reveal themselves. One is the compilation of statistics on language learning, language use and language attitudes; another is the method to be used to establish a proven correlation between the two sets of data. To solve the first problem, statistics of national and local education authorities could be compiled; but they would have to be supplemented by surveys and soundings for the variables of language use and language attitude. To solve the second problem, there are fortunately at our disposal a number of modern statistical methods of which multiple factor analysis and multiple regression seem promising.

4.2 The Validation of Language Attraction

Validation of the formula for the measurement of language attraction will depend on how well the language power equation stands up. The latter may come out with a positive or negative value; an attitude of great revulsion against a language can cancel out the effects of linguistic similarity and contiguity to give a negative value to the power of attraction.

Secondly there is the validation of the effects of territorial distance on interlingual attraction. If the effect of language power imbalance is decreased by distance at what rate is it decreased? In other words if we reduce the imbalance as we have pos-

tulated, by one percentage point per 125 miles (being 1/100 of half the circumference of the globe), we are assuming a fixed relationship between distance and influence; so we would have to prove that the relationship is indeed of this type. In practice, however, the decreasing degree of influence could be logarithmic in character, in which case our values would be variable -- smaller values for small distances but proportionately larger values for long distances. Only experimental evidence, therefore, will determine whether the distance-influence correlation is a straight line or a curve. Thirdly, to what extent are similar languages more attracted than highly different ones? If they are easier to learn to what extent does this encourage people to learn them? There seems to be some evidence that easy languages are the most popular with secondary school students, if they are given a free choice. But what is the effect of similarly on attitude? Are people more favorably disposed toward partly intelligible languages? Here again experimental evidence is needed.

In testing these three components of language attraction, it might be possible to study one at a time by keeping the other two constant. The effects of language attraction could be described as the total number of native speakers of one language learning a certain other language. It could also be the total interpenetration of two languages over a given period as the sum of lexical loans for that period.

Each of these components would also have to be weighted. Take for example, the case of Finnish facing Russian on one side and English on the other. Because Finnish is linguistically as far removed from Russian as it is from English, and these two great languages are comparable in power, one might imagine that the contiguity of the Soviet Union would be sufficient to neutralize the influence of English in Finland. But such apparently is not the case, since the attraction of English is strong enough to be maintained in Finland as one of the first foreign languages.

It would also be possible to check the direction of attraction by subtracting the weaker from the stronger indication of language power. The difference could be modified by territorial contiguity and language resemblance so that Language Group *a* has more attraction for *b* than *b* has for *a*.

4.3 Validation of Language Pressure

In situations of interlingual contact, as we have seen, these differences in power and attraction are expressed as pressures of one language group on another. But within the region, there may be other decisive elements not chosen as indicators of power and attitude. The press, education, and business may have been eliminated because of high correlation with other indicators; but at the local level, the language of reading, schooling, and work may prove

decisive. Here the method of validation depends on comparative regional studies including description of domains of language usage and the weighting of factors operating in each domain. Since language pressure itself is revealed in language behavior, the behavioral results must be isolated by experimentation before there can be a useful correlation made between a type and degree of language behavior and a given factor of language pressure. For example, to what extent does the regular reading of dailies in a language determine the penetration of that language into the home?

Before these measures of language power, attraction and pressure can become widespread, therefore a long process of validation must be completed.

CONCLUSION

What we have tried to do is to point out the existence of three geolinguistic concepts and to demonstrate that they may be measured by the use of certain indicators. By means of these indicators it is possible to gauge the influence of a language on a group of persons.

Language power, attraction and pressure are not, however, blind forces which automatically determine the fate of each individual. They are forces which can be politically manipulated and consciously countered by organized counter-forces such as regionalism, irredentism, purism and separatism.[38] History supplies examples of individuals and small groups who have changed the direction of entire language communities -- but only in cases where these communities possess a certain social dynamism combined with potential counter-forces capable of being integrated. Forces can be limited even to feelings of being different -- collectively different -- into a desire to upgrade this difference by some measure of self-determination.[38] Even in such a highly centralized country as France such groups may be found. After centuries of centralization and linguistic conformism, the Basques, the Bretons and the Occitants have claimed the right to be different. For it is always within the context of something shared that people have tended to give meaning to society and its social activity.

Some languages, however, have become so moribund that the majority of their speakers -- already bilingual -- may have given up all hope of language survival. Minority languages seem to be dying at an increasingly rapid rate as the power gap between languages sharply increases. And it seems that this sharp increase is a fairly recent development. Witness the phenomenal rise in the status of English during the 18th and 19th centuries. One wonders why so very few such languages have become so very dominant. Part of the answer may lie in one of our indicators which has to do with the standard of living.

There is no doubt that living standards have improved throughout the world, as witnessed by the decline in mass starvation and the rise in life expectancy. But they have improved much faster in some parts of the world than they have in others. Before the industrial revolution there was not nearly so much difference in living standards. In most countries life expectancy was about thirty years, and it was taken for granted that the masses were normally illiterate, poor, undernourished and often ill. All this changed, however, as societies became more and more industrialized. By 1850, incomes in industrialized societies were already double what they were in other countries. A century later they were ten times greater; and only a decade thereafter the ratio had increased to 15 to 1. If the curve is projected three decades hence, the difference in living standards between highly industrialized and non-industrialized societies will have reached a 30 to 1 ratio, and in some areas like North America as opposed to the Asian subcontinent, it is likely to become a difference of 50 to 1 or greater. In 1970, for example, per capita income in the United States was already forty times what it was in India.

Since there is a high degree of correlation between most indicators of language power, it is likely that such trends will affect the life expectancy of languages and consequently the success of language policies.

The possibility of success in the manipulation of linguistic forces, however, will depend on an understanding of their nature and an appraisal of their power. Anyone attempting such manipulation will eventually realize that there are limits beyond which the intrinsic power of a language cannot operate. One can perhaps coax a small plane to cross an ocean; but no amount of coaxing will enable it to reach the moon.

Another limitation to the possibility of establishing exact prognosis is the inherent instability of linguistic communities -- and indeed of society itself. Societies are not static. The forces which shape them are variable and their equilibrium is always unstable. Even before one can digest the mass of statistics which characterize a society, the data are already out of date. There are always built-in errors in statistical descriptions of speech communities, especially if they happen to be bilingual or multilingual.[27] We need a type of statistics which enables us to describe as a continuum the forces which we have just enumerated.

If we can succeed in measuring with tolerable precision, the potential of languages as linguistic power, attraction and pressure, we may be able to show legislators the extent to which they may expect, through linguistic laws and regulations, to modify the language behavior of man.

TABLE I

SEVEN INDICATORS OF LANGUAGE POWER
(with figures for ten languages

	1	2	3	4	5	6	7	
	D (+000 000 000)	R	M (+000 000)	E (+000 000 000)	I (+000 000)	C_1 (+000 000)	C_2 (+000)	F (/1000)
English	944	63	5 708	1 278	0	411	119	655
Russian	266	1	12	570	0	1 259	75	260
German	204	4	1 163	300	0	143	52	119
French	141	30	490	290	0	325	38	194
Spanish	88	29	1 509	130	0	14	34	166
Italian	78	1	306	82	0	4	8	031
Netherlandish	37	6	644	68	0	22	18	053
Arabic	26	27	188	40	465	3	3	298
Norwegian	10	0	12	10	0	7	4	004
Hebrew	4	0	421	5	17	3	2	023
Formulas	$p\bar{r}$	p-max$p$	$\Sigma(nd)$	Σ(GNP)	Σ(AFL)	ΣV	ΣB	$\frac{D+R+M+I+C}{5}$

p (population)

$\bar{r}$ (per capita income)

n (number of travellers)

d (distance)

GNP (Gross National Product)

AFL (Adherents using foreign liturgical language)

V (volumes in public libraries)

B (number of titles published per annum)

TABLE II

FUNCTIONAL TYPES OF URBAN CENTERS[41]

GOODS & SERVICES:	□	△	◯	◯	◎	◎	○
Automotive supplies Bulk oil Chemicals & paints Dry goods & apparel Electrical supplies Groceries Hardware Industrial & farm machinery Plumbing & heating Paper Tobacco & beer Drugs Lumber & construction	all	any 12	any 9	any 6			
Antiques Cameras Children's wear Florist Music store Photo studio Paint, glass & wall paper Plumbing & heating supplies Radio and television store Stationery Tires & batteries Women's accessories							
Family shoe store Farm & garden supplies Building materials Motel & hotel Jewellery Mortuary		all			any 4		
Appliance & furniture Laundry Clothing			all	all			
Garage & auto dealer Variety store Meat, fish & fruit General merchandise Bank Hardware Eating place					all	any 4	
Gasoline Service Station Grocery						all	all

TYPES: □ primary cities. △ secondary cities. ◯ trade centers. ◯ business towns. ◎ convenience centers. ◎ minimum convenience, ○ hamlets. (see maps)

TABLE III

III.I LANGUAGE DISTRIBUTION IN ACADIAN URBAN CENTERS

(New Brunswick)

	Total Population		Percent English		Percent French		Percent Others		Percent Change		Percent of trade population in center
	1961 tot	1971 tot	61 %	71 %	61 %	71 %	61 %	71 %	EN %	FR %	%
PRIMARY CITIES											
St. John-Simonds	87 613	19 290	92	91	7	8	2	1	2	17	64
Moncton	58 612	64 275	64	63	35	36	1	1	9	11	30
SECONDARY CITIES											
Fredericton	19 683	24 255	94	90	4	6	3	4	19	93	25
TRADE CENTERS											
Bathurst	15 914	19 750	44	48	55	51	1	1	36	15	14
Campbellton	9 873	10 335	52	50	47	49	1	1	1	1	41
Chatham	11 166	11 715	88	81	12	11	1	1	7	6	30
Edmunston (Grtr)	14 495	14 110	10	10	90	90	1	1	-4	-2	30
Newcastle	8 108	9 315	83	85	17	14	1	1	18	-2	14
Woodstock	5 873	6 255	95	98	1	1	1	1	6	-	9
BUSINESS TOWNS											
Grand Falls	5 685	6 160	36	34	62	65	1	1	3	12	27
Oromocto	12 170	11 425	91	94	7	4	2	2	3	48	86

TABLE III (Cont'd)

	Total Population		Percent English		Percent French		Percent Others		Percent Change		Percent of trade population in center
	1961 tot	1971 tot	61 %	71 %	61 %	71 %	61 %	71 %	EN %	FR %	%
CONVENIENCE CENTERS											
Bath-Kent Petitcodiac	3 775	4 285	99	18	1	2	1	-	12	-	32
Salisbury	4 351	4 900	98	97	2	3	1	1	12	65	44
Sackville	6 421	6 600	91	93	8	6	1	1	5	27	46
Shédiac	10 040	9 495	14	17	86	83	1	1	13	8	38

Sources: Statistics Canada and Urban Centres in the Atlantic Provinces

III.2 LANGUAGE ORIGIN, USAGE AND COMPETENCE (New Brunswick 1961-1971)

	English		French		Other		Both	
	61	71	61	71	61	71	61	71
	%	%	%	%	%	%	%	%
Ethnic Origin	55	58	39	37	6	5		
Mother Tongue	63	65	35	34	1	1		
Home Language	na	68	na	31	na	1		
Official Language	62	62	19	16	1	1	19	21

Ethnic Origin: Ethnic or cultural group of male ancestor on arrival on American continent.

Mother Tongue: Language first learned and still understood.

Home Language: Language most often spoken at home.

Official Language: Ability to conduct a conversation in English, French, in neither (other) or both.

na: Not asked in 1961
Rounded components and percentages may not always total a hundred.

Source: Statistics Canada

TABLE IV

URBAN JOB ATTRACTION IN ACADIA 1967

As distance travelled to work

Town	N. workers in sample	% of 1961 work force	One-way travel in miles			
			5	5-10	10-20	20+
Moncton	395	2.4	81.5	9.3%	6.3%	2.5%
Edmunston	562	14.0	98.9	0.2	0.9	-
Bathurst	902	47.2	84.0	12.5	1.4	1.9
Newcastle	378	7.2	65.3	28.3	4.2	2.1
Atholville	379	-	90.8	7.6	1.6	-
Minto	462	-	80.0	0.6	8.1	11.4
Caraquet	366	-	58.1	41.2	-	0.5
Shippegan	362	-	48.8	26.2	19.3	5.5
Belledune	528	-	30.3	33.3	27.6	8.7

Sources: Field and Postal Survey, 1967
Urban Centres in the Atlantic Provinces, Background Study 7
Ottawa: Atlantic Development Board 1969

TABLE V

PRESSURES OF ENGLISH AND FRENCH IN ACADIA (1961)

Indicators	Pressures	Proportions French	Proportions English
Proportion of the population	Demographic:		
	1. (3)	21	79
	2. Canada (1)	28	72
	3. Maritimes (N.B.) (1)	32	68
Non-contiguous states	Geographic:		
	4. World (2)	31	69
	5. Canada (1)	40	60
Land Mass	Distribution:		
	6. World (3)	26	74
	7. National (3)	35	65
	8. Regional (1)	60	40
As First Foreign Language	Cultural:		
	9. Dispersion (2)	41	59
	10. Intensit (3)	14	86
Printed Matter (regional)	11. Books (4)	17	83
	12. Monthlies (4)	16	84
	13. Weeklies (4)	16	84
	14. Dailies (4)	17	83
Broadcast hours (N.B.)	15. Radio (4)	31	69
	16. Television (4)	23	77
Films	17. Cinema (5)	01	99
Production (G.N.P.)	Economic:		
	18. Production (4)	44	56
Schools	Educational:		
	19. Schools (5)	27	73
Hours per week by language	20. Subjects (5)	28	72

Sources: 1. *Rapport de la Commission royale d'enquête sur le bilinguisme et le biculturalisme*, Ottawa, 1967. 2. H. Kloss et H. Dorion: Projets de démographie linguistique (Archives statistiques au C.I.R.B.). 3. E.G. Bowen (ed.), *A Physical and Regional Geography*, London, 1967. 4. *L'Annaire du Canada*, Ottawa, 1962. 5. Field Records (1958-67). Demographic note: Non-francophone ethnic minorities in Canada have been grouped with English-speaking population.

TABLE VI

CONCEPT ACCULTURATION

(Moncton, 1961)

	actions	religion	instru-ments	sports	trans-port
1. Tokens:					
French	1900	1381	759	1268	1231
English	1859	1034	990	1639	1474
2. Types:					
French	491	357	202	341	254
English	434	263	314	438	251
3. Loans:					
From French	0	42	16	4	0
From English	10	4	62	109	127
4. Penetration:					
French into English	0%	16%	5%	1%	0%
English into French	2%	1%	31%	32%	50%

Number and percentage of French and English words supplied by forty-one ten-year-old Acadians in five paired (French and English) tests of controlled word association with: actions, religion (church and parish life), instruments (tools), sports, and transport (automobiles and their parts).

TABLE VII

LINGUISTIC DEPENDENCE AND INDEPENDENCE

(Indices for ten languages: 1968)

	Independence L_i in %	ΣS (+ 00)	ΣT (+ 00)	ΣB (+ 000)	Dependence* L_d in %
English	+ 65	137	29	101	3
French	+ 20	51	34	27	13
Russian	+ 3	38	36	74	6
German	- 3	37	40	46	9
Italian	- 30	9	17	9	19
Arabic	- 44	1	3	3	9
Hebrew	- 44	2	4	2	22
Norwegian	- 52	3	9	4	22
Spanish	- 73	5	33	29	11
Netherlandish	- 74	4	28	15	18
$L_i = \frac{S}{\Sigma(S + T)} - \frac{T}{\Sigma(S + T)}$					$L_d = \frac{\Sigma T}{\Sigma B}$

S (Source): Books translated from the language during the period.
T (Target): Books translated into the language during the period.
B (Books): Titles published in the language during the period.

Source: 1970 Unesco Year Book.

* The dependence of a language does not necessarily mean the economic or political dependence of the people speaking it. The willingness or ability of a nation using a minority language to translate from other languages the important works of other nations may be a source of technological and cultural strength when such works are useful to the economic, technological or cultural advancement of the country.

TABLE VIII

LANGUAGE DEPENDENCE RELATED TO INCOME AND POPULATION

LANGUAGE	population* (+ 000 000)	p.c. income ($--approx.)	$L_{\%d}$	$L_{\%i}$
English	271	3 500	3	+65
Russian	133	2 000	6	+ 3
German	81	2 300	9	- 3
French	54	2 650	13	+20
Spanish	135	630	11	-73
Italian	49	1 600	19	-30
Netherlandish	18	1 300	18	-74
Arabic	77	270	9	-44
Norwegian	4	2 800	22	-52
Hebrew	3	1 650	22	-44

* underestimated at about 3%, due to disparity in dates of data.

If population is equal, language dependence seems to be a function of difference in per capita income; if income is equal, language dependence and independence do not seem to be proportional to differences in population.

TABLE IX

STANDARDIZED INDICES OF LANGUAGE POWER

LANGUAGE	D	R	M	I	C	F
English	1.000	1.000	1.000	0	0.326	.6652
Russian	0.282	0.016	0.002	0	1.000	.2600
German	0.216	0.063	0.203	0	0.114	.1192
French	0.149	0.476	0.086	0	0.258	.1938
Spanish	0.093	0.460	0.264	0	0.011	.1656
Italian	0.083	0.016	0.054	0	0.003	.0312
Netherlandish	0.039	0.095	0.113	0	0.017	.0528
Arabic	0.028	0.429	0.033	1.000	0.002	.2984
Norwegian	0.011	0	0.002	0	0.006	.0038
Hebrew	0.004	0	0.074	0.037	0.002	.0234

Raw totals for each indicator standardized on a maximum of 1.000 and converted into corresponding number.
F is the unweighted average of the five indices.

TABLE X

LANGUAGE POWER AND LANGUAGE DEPENDENCE

Coefficients of correlation between each of the five indicators of language power and the indicators of language dependence and independence.

	p_D	p_R	p_M	p_I	p_C	r_{F*}
L_d	.70	.65	.57	.20	.57	.84
L_i	.83	.56	.63	.17	.54	.74
$L_d L_i$	.86	.67	.66	.44	.62	.85

* using the formula:

$$r = \frac{\sum_{i=1}^{n} x_i y_i - n\bar{x}\bar{y}}{\sqrt{\left(\sum_{i=1}^{n} x_i^2 - n\bar{x}^2\right)\left(\sum_{i=1}^{n} y^2 - n\bar{y}^2\right)}}$$

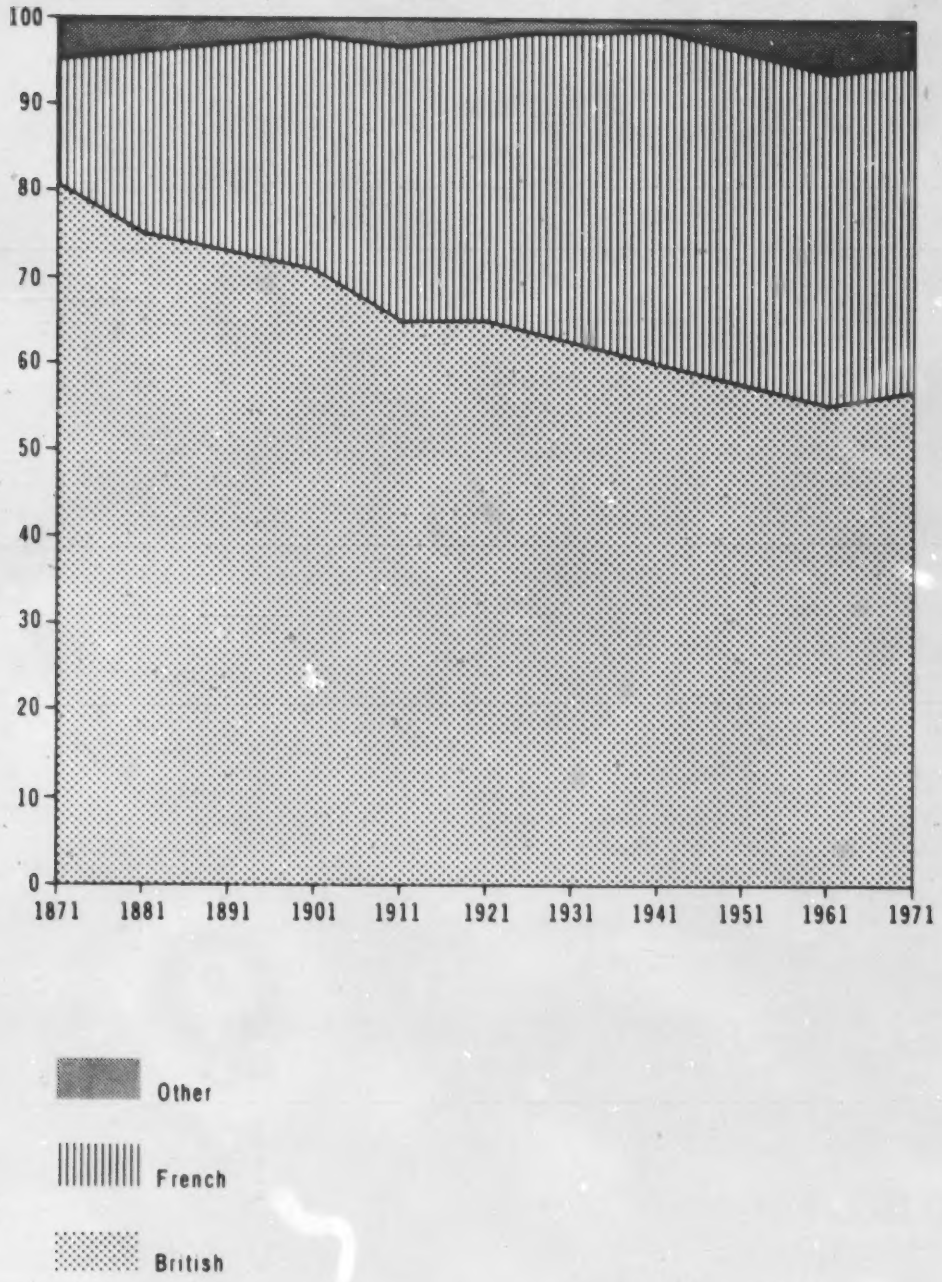
where $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ and $\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$

$n = 10$ (languages)

$x_i = F$ $\qquad$ $yi = L_i$, L_d or $L_d L_i$

A CENTURY OF CHANGE IN ETHNIC COMPOSITION

(NEW BRUNSWICK:1871-1971)



Sources: Statistics Canada. J. Henripin, et al, Etude des aspects démographiques des problèmes ethniques et linguistiques au Canada. Ottawa: Royal Commission on Bilingualism and Biculturalism 1966.

Figure 1

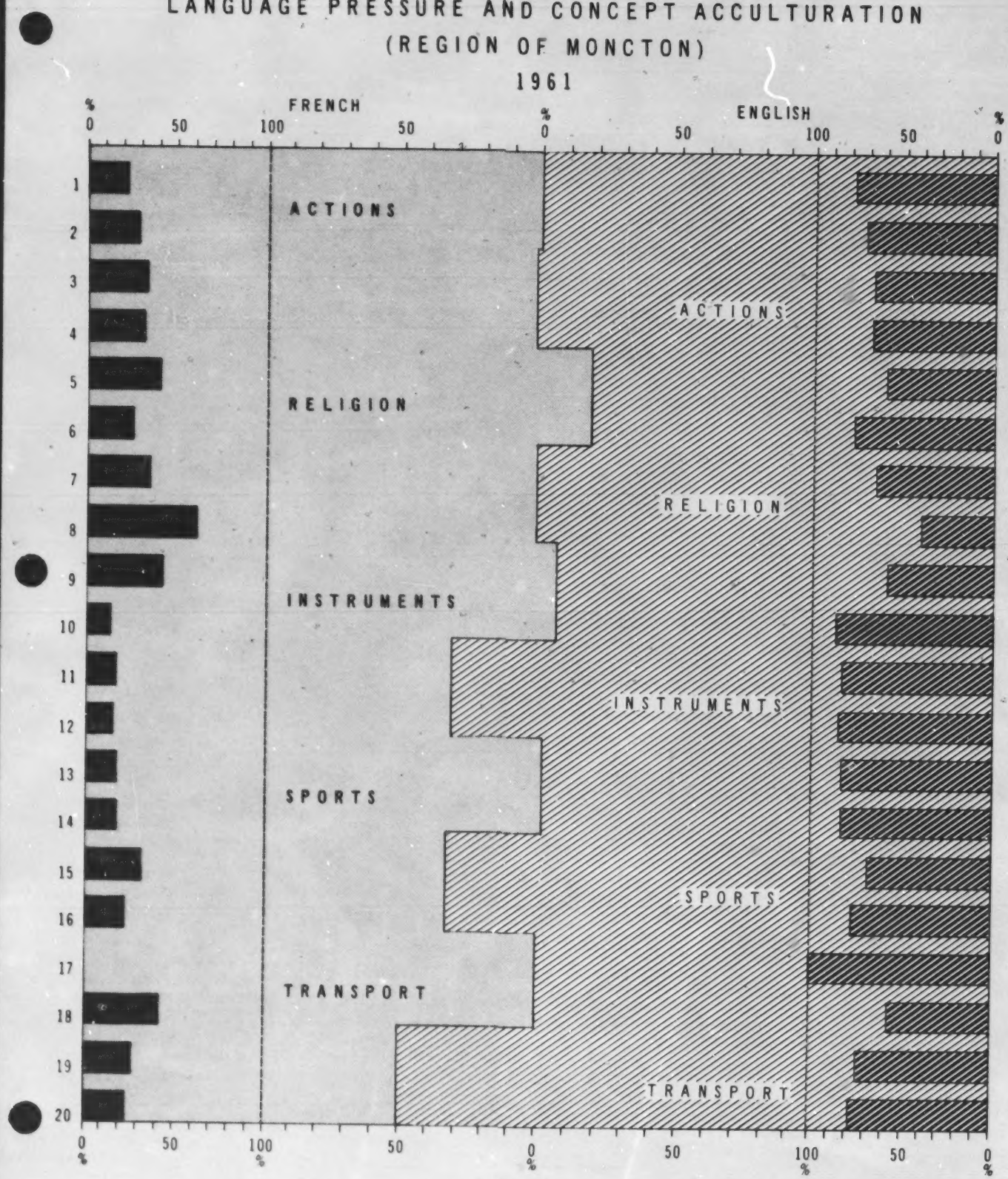
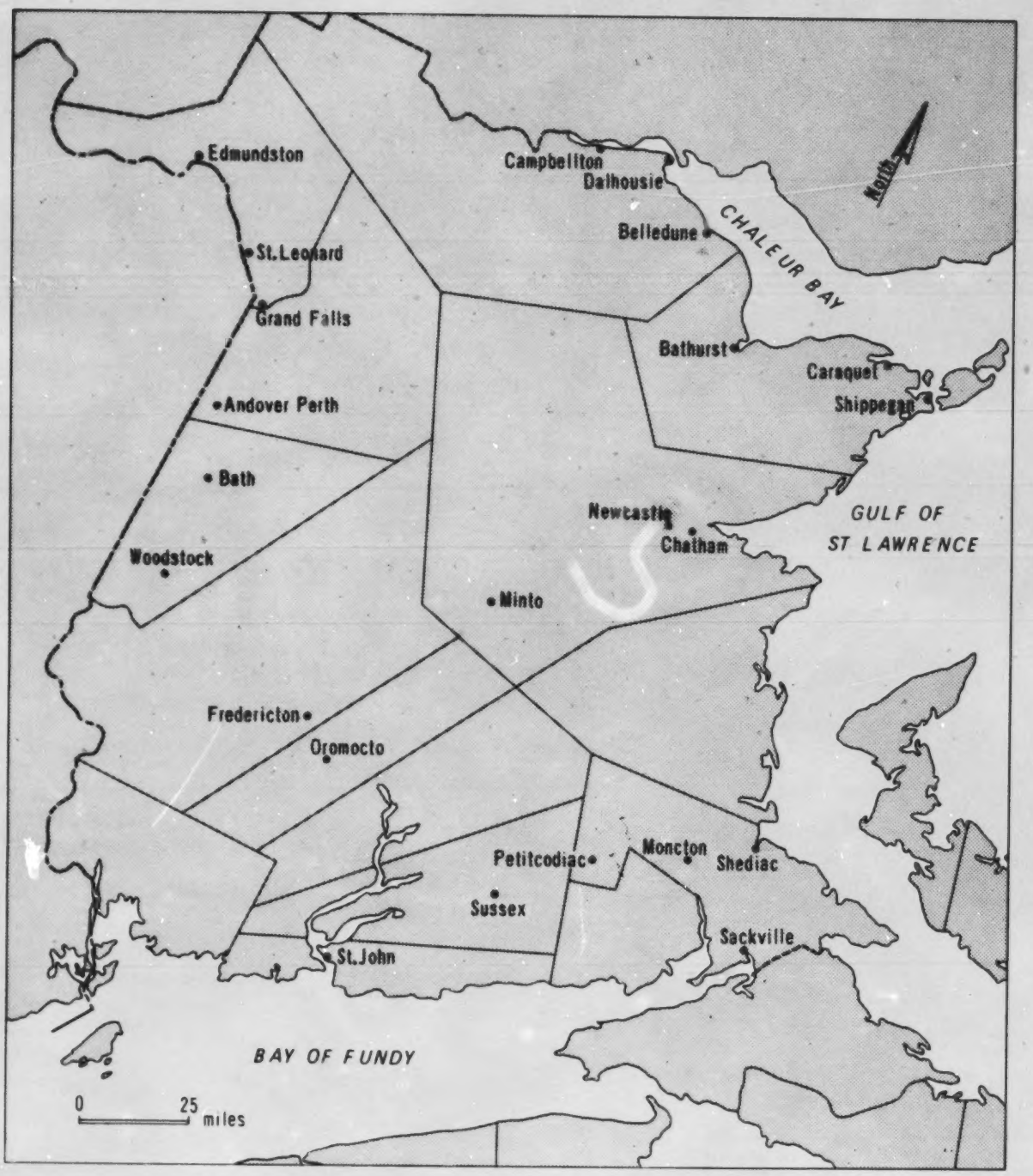
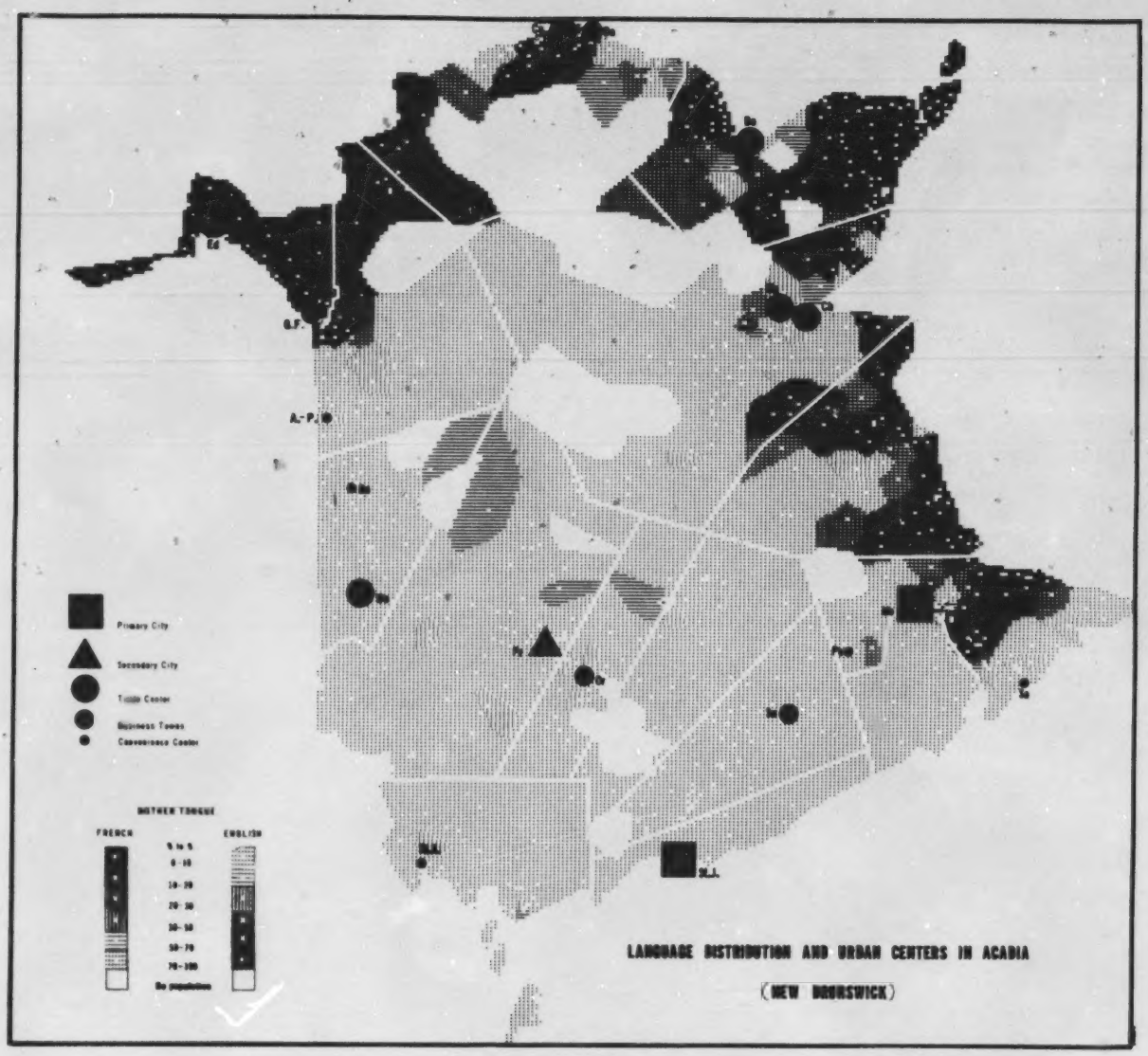

LANGUAGE PRESSURE AND CONCEPT ACCULTURATION
(REGION OF MONCTON)
1961
FRENCH
ENGLISH
% 0 50 100 50 % 0 50 100 50 % 0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
ACTIONS
RELIGION
INSTRUMENTS
SPORTS
TRANSPORT
ACTIONS
RELIGION
INSTRUMENTS
SPORTS
TRANSPORT
0 % 50 100 % 50 0 % 50 100 % 50 0 %

Figure 2

NEW BRUNSWICK




Primary City
Secondary City
Trade Center
Business Towns
Convenience Center
MOTHER TONGUE
FRENCH
ENGLISH
% in %
0-10
10-20
20-30
30-50
50-70
70-100
No population
A-P.
LANGUAGE DISTRIBUTION AND URBAN CENTERS IN ACADIA
(NEW BRUNSWICK)

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STATISTICAL APPENDIX

DEMOGRAPHIC, ECONOMIC, CULTURAL AND LINGUISTIC DATA
(By Language and Country)

1. Number of native speakers of the language in the country.
2. Annual per capita income of the population.
3. Municipal library holdings.
4. Annual book production.
5. Number of books translated per annum into the language.
6. Number of books translated per annum out of the language.

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LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
GERMAN	81 170 000						3 960	3 721
D= 204 781 780 000								
German Federal Republic	53 320 000	*ANM* 61	2 698	70	46 576	33 454	3 023	-
German Democratic Republic	16 975 000	*ANM* 61	2 000	est.	24 666	5 568	-	-
Switzerland	4 000 000	*SS* 60	2 859	70	6 902	7 505	618	-
Luxembourg	10 000	*ANM* 61	2 162	69	-	-	-	-
Liechtenstein	15 000	*ANM* 61	2 000	est.	-	-	-	-
Austria	6 850 000	*ANM* 61	1 728	70	3 418	5 204	319	-
ENGLISH	271 372 952						2 893	13 698
D= 944 210 363 838								
United Kingdom	53 395 460	*OHB* 72	1 933	70	77 200	32 538	631	-
United States	179 000 000	*LW* 65	4 262	70	201 138	62 083	2 183	-
Canada	12 973 810	*SC* 71	3 214	70	21 635	3 659	40	-
Australia	11 000 000	*LW* 65	2 434	69	9 547	3 939	22	-
New Zealand	2 500 000	*LW* 65	2 004	70	2 891	-	-	-
South Africa	1 150 738	*DY* 65	728	70	-	2 641	-	-
Botswana	3 000	*SY* 60	97	67	16	-	-	-
Rhodesia	190 000	*ANM* 61	252	70	250	-	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
ENGLISH (cont'd)								
Lesotho	1 569	*DY* 56	82	67	-	-	-	-
Gambia	1 000	*DY* 60	79	63	22	-	-	-
Sierra Leone	1 000	*CHRNM* 62	120	63	-	-	-	-
Liberia	7 000	*ANM* 61	181	68	46	-	-	
Ghana	6 994	*DY* 64	222	68	609	446	-	-
Nigeria	20 000	*CHRNM* 62	71	63	-	-	-	-
Cameroon	5 000	Muller 64	120	63	19	-	-	-
Uganda	10 000	*CHRNM* 62	68	63	88	-	-	-
Kenya	65 000	*ANM* 61	82	63	144	-	-	-
Tanzania	20 000	*ANM* 61	91	70	1 579	30	-	-
Malawi	10 000	*ANM* 61	55	67	24	-	-	-
Zambia	31 000	*CHRNM* 62	375	69	158	-	-	-
India	223 781	*ILT* 61	88	69	8 804	13 733	-	-
British Honduras	10 000	*ANM* 61	249	69	74	-	-	-
Somalia	500	est. 61	65	63	-	-	-	-
Hong-Kong	37 400	*DY* 66	434	63	174	-	-	-
Malaysia	12 000	*ANM* 61	302	67	308	-	-	-
Singapore	9 000	*ANM* 61	921	70	25	533	-	-
Philippines	10 689 200	*SY* 72	342	70	712	-	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
ARABIC	77 436 422						291	112
D= 25 743 730 530								
I=465 237 000 (*WCH*)								
Morocco	8 145 000	*ANM* 61	186	69	-	-	-	-
Algeria	8 450 000	*ANM* 61	251	68	61	289	-	-
Tunisia	4 065 000	*ANM* 61	215	69	331	-	-	-
Spanish Sahara	40 000	*SY* 72	100	est.	5	-	-	-
Mauritania	620 000	*ANM* 61	101	63	-	-	-	-
Mali	60 000	*ANM* 61	71	63	-	-	-	-
Yemen	4 500 000	est.	500	est.	-	-	-	-
Niger	125 000	*RSL* 62	78	63	-	-	-	-
Sénégal	30 000	*CHRHM* 59	190	69	52	-	-	-
Nigéria	91 000	*CHRHM* 59	71	63	-	-	-	-
Libya	1 135 000	*ANM* 61	1 305	68	29	-	-	-
United Arab Republic	26 554 000	*ANM* 61	203	69	825	1 699	219	-
Chad	875 000	*ANM* 59	58	63	8	-	-	-
Sudan	5 276 207	*DY* 63	104	68	-	-	-	-
Ethiopia	53 000	*ANM* 61	44	63	105	-	-	-
Syria	4 200 000	*ANM* 61	244	68	288	-	27	-
Jordan	1 650 000	*ANM* 61	280	69	45	224	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
ARABIC (cont'd)								
Iran	400 000	*CHRIM* 59	341	70	-	-	-	-
Irak	6 459 233	*ICSO* 65	274	69	403	569	13	-
Saudi Arabia	6 000 000	*ANM* 61	350	69	71	-	-	-
Muscat and Oman	500 000	*ANM* 61	86	63	-	-	-	-
Lebanon	1 800 000	*ESPAL* 70	487	68	-	-	32	-
Kuwait	407 982	*CK* 65	3 880	68	-	-	-	-
SPANISH D= 87 926 183 000	135 036 650						3 299	515
Spain	26 789 000	*LW* 65	889	70	3 412	20 031	2 538	-
Spanish Sahara	23 000	*SY* 72	100	est.	5	-	-	-
Mexico	31 328 000	*LW* 65	632	70	1 607	4 558	393	-
Puerto Rico	2 480 000	*LW* 65	1 537	69	159	-	-	-
Cuba	6 820 000	*ANM* 61	500	est.	449	995	-	-
Dominican Republic	3 040 000	*ANM* 61	272	68	-	71	-	-
Philippines	558 650	*SY* 72	342	70	712	335	4	-
Guatemala	2 222 000	*ANM* 61	338	70	-	335	-	-
El Salvador	2 600 000	*LW* 65	271	70	-	27	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
SPANISH (cont'd)								
Honduras	1 900 000	*LW* 65	249	69	74	189	-	-
Nicaragua	1 500 000	*LW* 65	387	70	-	-	-	-
Costa Rica	1 180 000	*ANM* 61	501	70	2 839	294	-	-
Panama	1 000 000	*LW* 65	629	70	57	195	-	-
Venezuela	6 030 000	*LW* 65	837	70	194	747	8	-
Colombia	12 070 000	*LW* 65	358	70	547	704	-	-
Peru	5 090 000	*LW* 65	363	70	240	783	23	-
Ecuador	3 500 000	*LW* 65	247	70	2 540	-	-	-
Bolivia	1 750 000	*LW* 65	180	70	120	-	-	-
Chile	6 640 000	*LW* 65	613	70	944	1 546	5	-
Argentina	15 264 000	*LW* 65	914	69	-	3 645	328	-
Paraguay	900 000	*LW* 65	230	70	-	-	-	-
Uruguay	2 352 000	*LW* 65	773	70	-	341	8	-
FRENCH	53 643 452						3 384	5 128
D= 140 606 935 967								
Canada	5 793 650	*SC* 71	3 213	70	21 635	3 659	66	-
Switzerland	1 025 450	*SS* 60	2 859	70	6 902	7 505	544	
Luxembourg	10 628	*CL* 70-60	2 162	69	-	-	-	-
Morocco	106 291	*UNUNE* 68	186	69	-	-	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
FRENCH (cont'd)								
Algeria	77 600	*DPA* 66	251	58	61	-	-	-
Tunisia	180 440	*RTSS* 70	215	69	331	-	-	-
Mauritania	4 059	*VDF* 70	101	63	-	-	-	-
Mali	2 620	*VDF* 70	71	63	-	-	-	-
Niger	2 834	*VDF* 70	78	63	-	-	-	-
Sénégal	22 027	*VDF* 70	190	69	52	-	-	-
Chad	2 090	*VDF* 70	58	63	8	-	-	-
France	42 750 000	*LW* 65	2 606	70	29 040	21 571	2 035	-
Guinea	1 599	*VDF* 70	95	63	2	-	-	-
Ivory Coast	25 262	*VDF* 70	309	70	35	38	-	-
Upper Volta	3 543	*VDF* 70	45	63	29	-	-	-
Togo	7 793	*VDF* 70	79	63	11	-	-	-
Dahomey	2 752	*VDF* 70	71	63	-	-	-	-
Cameroon	13 197	*VDF* 70	120	63	19	-	-	-
West Africa Republic	4 652	*VDF* 70	101	63	-	-	-	-
Gabon	11 819	*VDF* 70	688	70	6	-	-	-
Congo	7 389	*VDF* 70	180	63	20	-	-	-
Zaïre	18 000	Walloons *ANM* 67	65	68	229	-	-	-
	+ 4 114	French *VDF* 71						
	22 114							

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
FRENCH (cont'd)								
Ruanda	287	*VDF* 70	32	63	10	-	-	-
Burundi	366	*VDF* 70	44	63	26	-	-	-
Madascar	48 835	*VDF* 70	124	70	16	156	-	-
Haïti	400 000	*LW* 65	74	63	35	-	-	-
Laos	3 197	*VDF* 70	61	63	16	57	-	-
Belgium	3 112 958	*HVE* 66	2 406	70	14 648	5 089	739	-
HEBREW								
D= 4 188 160 000 I= 17 146 250 (*WCH*)	2 560 000						406	157
Israel	2 560 000	*SY* 72	1 636	70	3 500	2 038	406	-
ITALIAN D= 78 440 225 854	49 019 306						1 688	917
Italy	48 500 000	*ANM* 61	1 587	70	41 000	8 440	1 688	-
Somalia	5 000	*LW* 65	65	63	-	-	-	-
Switzerland	514 306	*SS* 60	2 859	70	-	-	-	-

LANGUAGE Country	1. Native Speakers	Source & year	2. Per capita income	Year (Source: *AS* 19-)	3. Library Holdings (+ 000) *USY*	4. Annual Book Production N. titles *USY* & *AS*	5. Per annum Translations INTO the Lg. N.titles *USY*	6. Per annum Translations OUT of Lg. N.titles *USY*
NETHERLANDISH (incl. Afrikaans & Flemmish)							2 807	414
D= 37 222 412 432								
Netherlands	11 050 000	*ANN* 61	2 156	70	-	11 204	1 945	-
South Africa	2 194 417	*DY* 56	728	70	-	2 641	16	-
South West Africa	75 000	*ANN* 61	200	est.	-	-	-	-
Lesotho	1 000	*CHRNM* 62-59 P. 278	82	67	-	-	-	-
Surinam	10 237	*ESP* 64	438	67	-	-	-	-
Belgium	4 850 000	*ANN* 61	2 406	70	14 648	5 089	846	-
Zaïre	25 000	Flemish: *CHRNM* 62-59 Note 4, p. 269	65	68	229	-	-	-
	+ 1 000 26 000	Dutch: ibid, note 3						
NORWEGIAN	3 600 000						858	271
D= 10 278 000 000								
Norway	3 600 000	*LW* 65	2 855	70	7 350	3 935	858	-
RUSSIAN	133 015 000						3 607	1 526
D= 266 030 000 000								
U.S.S.R.	133 000 000	*LW* 65	2 000	Time, March 12, 1973	1 258 655	74 611	3 607	-
Mongolia	15 000	*ANN* 61	2 000	est	-	-	-	-

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